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Windows 2000 MAGAZINE

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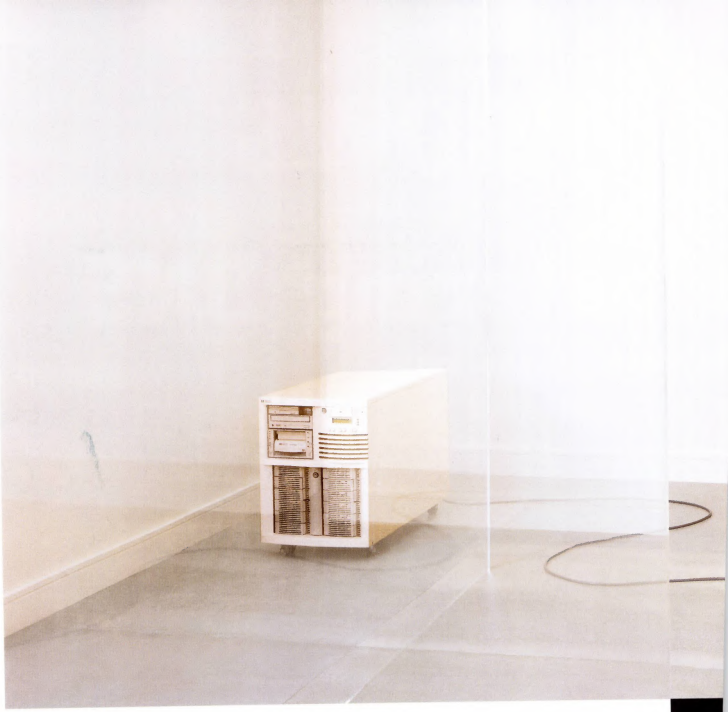

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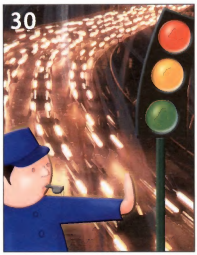

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Dotting the Net

At this year's recent annual gathering of local developers in Cairns, Microsoft made it clear that its focus for the coming year was going to be the .Net (dotNet) platform.

Microsoft.Net is the company's Internet strategy and its next big meal ticket. Under this initiative, Microsoft will use XML, SOAP and other standard languages and interfaces to connect individual Web servers and sites into combined services. The services will be accessed using a variety of devices, including conventional PCs, handheld computers, smart mobile phones and Internet-enabled TVs.

It signals a whole new approach to development as it assumes that every application (that runs off a Microsoft platform at any rate) will eventually access the Web in one form or other. As such the company is integrating this .Net strategy into its existing development tools such as Visual Studio. It is making its existing server line of products fully Web enabled to support applications that will leverage on the advantages of Internet technology. And the company is introducing a host of building blocks and device applications to make the .Net vision a reality.

Much of the attention on .Net has focused on XML and SOAP, but reports coming out of the US claim that the Common Language Runtime is equally important. According to Meta Group analysts, the Common Language Runtime will let enterprises preserve and re-use code more efficiently and make better use of a developer's time.

The Common Language Runtime now supports 17 languages, including Perl, Cobol, JScript, C, C++, Visual Basic and Microsoft's new C# (C sharp) language, introduced late June as a competitor to Java.

How will this impact on users who are committed to the Microsoft platform? If you're someone who bought into Microsoft's Windows DNA 2000 promise, then things have got that little bit clearer. As explained by Michael Risse, Microsoft's general manager of Windows DNA and Web Services: "The Microsoft.Net initiative maps Microsoft Windows DNA 2000 architecture to the whole of Microsoft. You could say that the Windows DNA effort was the leading edge of thinking that lead to .Net and that the rest of the company lined up behind it."

The tools, application services and the server applications that are part of Windows DNA 2000 are all part of .Net. What Microsoft has done is to add new capabilities. These include new user interfaces with Office.Net, the ability to bake these types of Web services more completely into the operating system with Windows.Net and a set of .Net building blocks that allow some functionality such as calendars, user authentication and electronic wallet service to be assembled into applications instead of developers having to create their own.

These new applications will also give rise to new delivery models. Risse sees three different models for these new generation of applications. The first model is a direct supply system where a vendor – such as an insurance company – provides services directly to the customer. The second is an indirect model where the products are hosted by a third party and the third model is an employer model where an employer builds products that are only used by its employees. The difference between the direct and employer model is that the former runs outside firewalls while the latter runs inside the firewall to the employees. Microsoft supports all three.

While all these developments are well and good, the prospect of having Web-enabled applications developed on a Microsoft platform is a bit frightening from a security standpoint, given the company's reputation in that quarter. Aside from Microsoft's profuse assurances, there is little to indicate that these systems won't carry a back door or two. One can only hope that the programmers at Microsoft have learnt the lessons of the "I Love You" and Melissa virus attacks and close up easily exploitable flaws. ❑

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A nightmare come true

It was one of those occasions any IT manager dreads. The moving of servers from one location to another that brought home to me the horror of having to deal with a serious system crash.

Recently DWR Media, publishers of Windows 2000 Magazine Australia, moved from Cremorne to new premises in North Sydney. Using the services of relocation specialists Movers and Shakers – a company that had assured DWR that they had extensive experience in relocating servers – we embarked early one Saturday morning to move several servers including a 200Gb 4 way IBM Netfinity server.

Arriving at our new premises in Walker St North Sydney, where we had installed a custom built computer room, we discovered that our main server had been banged during the move, with scrape marks and dents down the outside of the cabinet. Maybe alarm bells should have gone off when Movers & Shakers tried to charge us more than $3,000 in insurance cover for the move – cover which DWR obtained via our brokers for $395.00.

It was the words "Do you mind turning the computer on to see if it works" that started what was to be a week of horrors. Rebooting the server I discovered that it was taking a long time to fire up. Eventually it came back to life. Great I thought – no problems!

I then ran a diagnostics check only to have the application hang. Then it happened – the blue screen of death. In trying to boot the system I was faced with an error message indicating that the system could not find a boot disc. I also had three disc failure lights flashing across the first bank of raid arrays. This is a worse case scenario. At this point, 2.00pm on a weekend, I turned to IBM support. IBM had a support engineer on site by 3.00pm. The first diagnosis did not look good. We had raid controller problems logging into IBM global support. The engineer located a new controller in Melbourne. By 7.00pm it was on site in North Sydney. Within minutes we diagnosed further problems, possibly backplane damage to the raid controllers. Again IBM located parts in seconds. This time in Auckland. By 8.00am the following morning the parts were on site.

Despite this, we were diagnosing further problems relating to the operating system. The bottom line was that the server when knocked had damaged the connections between the raid system and the server resulting in an electrical spark hitting the system. This in turn had zapped the operating system.

At this stage we called in additional system support in Complete Network Engineering. In the end, they diagnosed a complete system rebuild.

Easy we thought, we had a backup of our data so reloading the operating system and restoring data would only take hours. Wrong! Firstly engineers who had upgraded our system months prior with an additional bank of raid storage, had failed to create a new raid configuration disc. Access to the data that was left on the system was set to be lost, until a sharp eyed IBM engineer spotted that we had changed a raid controller prior to the crash.

We had to find that old controller so that we could extract the system configurations from the BIOS. This resulted in us being able to restore access. Then came the horror of reconfiguring Microsoft Exchange. Our old operating system security settings were not working. After a 5-hour support call with Microsoft, we were able to access a back door into restoring our old Exchange setting and 10Gb of e-mail. Then came the task of reconfiguring our user settings and bringing the network back. Having installed a brand new CAT six network we then had the job of bringing each user online in a new configuration.

Then came our second drama, a brand new additional 200Gb 2 way IBM server with 2GB of memory had arrived to sit along side our application server. Delivering the cabinet and memory to our computer room the courier returned to his truck, which he assured us was locked, to find that someone had mysteriously in a space of 5 minutes heisted a 65kg IBM Netfinity Server from the middle of North Sydney complete with casing.

Police are now looking for at least two thieves with radar vision, a big truck, and lightening fast get away skills. ❑

Bargain basement Windows Me

Michael ▶ Risse Look up Microsoft's XML Web site and SOAP toolkit

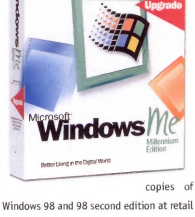
Microsoft Corporation in Australia recently announced a limited time special promotion for Windows Me that will lower the cost of the upgrade by $97 from the listed price when the new operating system goes on sale this month.

The promotion, which applies only to the retail upgrade version, will lower the price temporarily from $206 to $109 (all prices include GST).

The special discount will apply from September 14 until January 15, said Paul Roworth, Windows product marketing manager at Microsoft Australia. The Windows Me promotion applies only to Windows 98 and Windows 98 second edition users.

The move gives customers added incentive to upgrade their existing machines. Of course, one might wonder why Microsoft would heavily discount a product like this before it is released. Microsoft makes the vast majority of its Windows revenues on machine bundles: For example, the company sold approximately four million

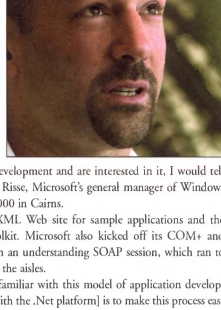
Special four-month discount will almost halve the cost of an Me upgrade



copies of Windows 98 and 98 second edition at retail over two years, but it sold well over 150 million copies bundled with new machines.

Windows Me is the last product in the Windows 9x line.

Brush up on XML and SOAP



Developers looking to offer third generation type Web services using Microsoft.Net infrastructure need to study XML and SOAP (Simple Object Access Protocol).

SOAP is an XML based network protocol, and a joint effort between Microsoft and IBM. It combines HTTP and XML technology to increase the interoperability of a wide range of programs and platforms.

"For developers who don't know about this kind of Web application development and are interested in it, I would tel them to look at XML," said Michael Risse, Microsoft's general manager of Window DNA and Web Services at Tech Ed 2000 in Cairns.

Microsoft offers as resources an XML Web site for sample applications and th Visual Studio site for the SOAP toolkit. Microsoft also kicked off its COM+ an Windows DNA track at Tech Ed with an understanding SOAP session, which ran t full capacity and had people sitting in the aisles.

"Those developers who are more familiar with this model of application develop ment realise that what we are doing [with the .Net platform] is to make this process eas ier," said Risse.

To demonstrate the capability of third generation type Web applications, he use the example of an injured traveller calling his doctor's surgery in a different state an having the staff use an Internet application to locate and schedule an appointmen with a local doctor who would accept his insurance plan. While still on the line th traveller could use his mobile phone, to send approval for his medical records to be fo warded to the local doctor.

This hypothetical system would be built and run using the .Net platform which made up of four components – the Visual Studio.Net development framework, th .Net enterprise servers, the .Net building blocks and the .Net device software.

Visual Studio.Net provides the middleware framework for developing applicatio while the seven .Net enterprise servers builds and integrates the front end, back er and the operation of .Net applications. The enterprise servers include SQL Serv 2000, Exchange 2000 Server, Commerce Server 2000, Internet Security a Acceleration Server 2000, Host Integration Server 2000, Biztalk Server 2000 a Application Center 2000.

The .Net building blocks allow developers to drop features into their applicatio instead of having to design it from scratch. Microsoft's existing Passport user authe tication and electronic wallet service is an example of this.

The .Net device software allows mobile phones and pocket PCs to access th applications.

The middleware framework and the servers are currently in beta, with the fi release of these products expected in 2001. SQL Server 2000 is expected earlier being released to manufacturing this week.

Microsoft plans to start rolling out the .Net building block services from 20 with the full range available in 2002.

High hopes for SQL Server 2000

Terry Clancy

Benefits in using SQL Server & OLAP Services as the data warehouse in front of an Oracle database.

Microsoft Australia has high hopes for SQL Server 2000 which is to be launched on September 26, despite the difficulties it faces in breaking into Oracle held customer sites.

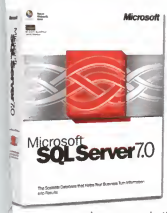
Various research by Morgan Stanley, Dataquest and Company Financials showed SQL Server to have 71 percent of unit share on the Windows platform worldwide compared to Oracle with 18 percent. SQL Server 7.0 also achieved higher growth in terms of both revenue (80 percent compared to Oracle's 17 percent) and units (10.3 million compared to Oracle's 6.8 million) shipped in 1999.

Terry Clancy, Microsoft Australia's senior product marketing manager for enterprise data systems, said that the company expected revenue from sales of the next generation of SQL Server to come from upgrades and Oracle database installations looking for data warehouse systems.

"The Oracle data warehouse offering is really old generation and behind all the competition. Oracle Express is long in the tooth and of old architecture. If you ask just about anyone in the industry, they will tell you that it is a very old product compared to state of the art products such as Hyperion Sbase and Microsoft OLAP Services," said Clancy in an interview at Tech Ed 2000 in Cairns.

He added that this was the reason why there was a high penetration of Hyperion Sbase in Oracle installed bases. "And increasingly we are getting a big penetration of OLAP Services and SQL Server being used as the data warehouse in such cases."

Some of the benefits seen by customers using SQL Server and OLAP Services as the data warehouse in front of an Oracle database are a lower cost and an easier build process. In addition, SQL Server's standardised approach to data handling allows organisations to use products from 45 different vendors such as Cognos, Brio, Business Objects and Microsoft Excel to manipulate and present this data.



"Oracle Express in comparison does not have a standard way of doing this," added Clancy.

The biggest challenge at the moment for Microsoft is getting a foot in the door at Oracle installations. "The reason why Oracle still has a strong business is that in a lot of its installed accounts, the decision for new products happens to default on to Oracle without us having the opportunity to go out there and fight for it," said Clancy.

The company also believes that the Web enhancements built into SQL Server 2000 such as native XML support and Web based access, querying and analysis features will help to break down existing barriers and further its growth in the e-business market. Research by Media Metrix in the US show SQL Server to be in 22 of the top 50 retail sites by visitors and PC Data found SQL Server driving 13 of the top 20 retail sites by transactions.

Dell revs up Web with PowerApps

Dell has launched two PowerApp devices that make it easier for small to medium sized companies to put in place Web systems.

The PowerApp devices are a software and hardware bundles that provide specific Web functions such as caching, firewall and load balancing.

Geoff Healey, Dell's Asia Pacific director for the server business, said: "Dell has tested and selected the best of breed applications available for a particular function and has bundled that software into the PowerApp device."

He predicted that in three years, one third of server units sold would be from the PowerApp server lines.

Currently, the company offers the PowerApp.web 100 which provides Web server functions and the PowerApp.cache for Web caching functions.

The PowerApp.web appliance comes in a Microsoft's Windows Web hosting server software and Linux versions.

Healey expects the Linux versions to be popular at the front end of the Web while Windows will do better at the core because of the management features that come with the Windows operating system. "Windows will treat the PowerApp as just another device on the network," added Healey.

SQL Server is in 22 of the top 50 retail sites by visitors

The PowerApp.cache device uses the Novell Internet Caching (ICS) application.

Firewall and load balancing appliance are due to be released later this year. Dell plans to have up to 10 different PowerApps. The pricing of the PowerApp.web products start at $5,453 (GST inclusive) while prices for the PowerApp.cache boxes start at $10,698.

Oracle adds final Linux piece

Oracle has finished porting all of its enterprise-level software to the Linux operating system.

The company said a Linux version of Oracle Internet Application Server is available for download from its developers' Web site, the Oracle Technology Network. Software developers may download the server free of charge. Deployment will require a licence priced at US$5 per universal power unit (UPU) for the standard edition and US$30 per UPU for the enterprise edition.

Oracle also began shipping the wireless edition of its application server for Linux, priced at US$150 per UPU and US$95 per named user.

Wang quits top job

Computer Associates founder and CEO Charles Wang has resigned from the company's top job amid plunging profits and a major reorganisation.

CA president and chief operating officer Sanjay Kumar will take over as CEO, while Wang will remain chairman, and is expected to spearhead new ventures.

The company is also set to spin off its software and services businesses, and is planning a later spin-off of its desktop accounting business and some other technology operations.

Charles Wang to remain Computer Associates chairman and spearhead new ventures

CA's ASP business will be the first to be spun off. It will be called iCan-ASP, but it is not yet determined if the stock will be a tracking stock or other issue. "The ASP marketplace is large and growing rapidly, and iCan-ASP offers new and innovative technologies for providing applications through the Internet, wireless, and broadband communications," the company said.

The company also announced a spin-off of Accpac, its accounting software unit. The company failed in a previous attempt to spin off Accpac about a year ago when the market showed limited interest in the IPO.

The company said it will continue to focus on its core business software for network security, data storage management, and programs meant to improve predictions of buying patterns.

Wang, who founded CA in 1976, has at times been a lightning rod of controversy. The native of Shanghai, China, has been praised for pledging a donation of US$25 million to the State University of New York at Stony Brook. But he also has been vilified for axing workers at companies bought by CA and for his large pay packages.

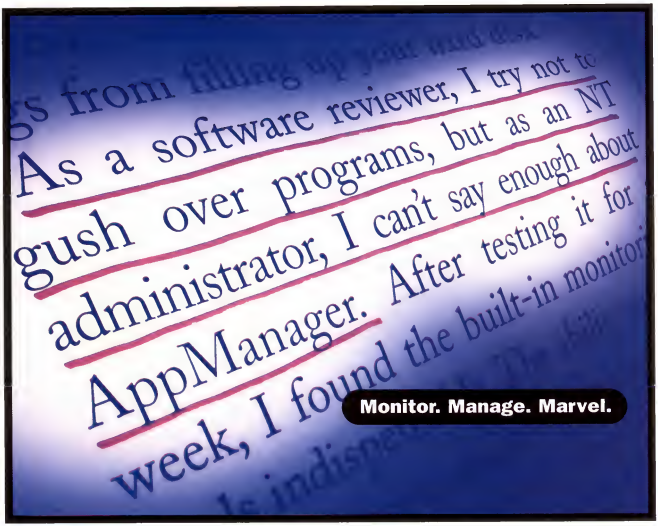
In 1998, the company granted 20 million shares worth US$1.1 billion to Wang, Kumar, and Russell Artzt, executive vice-president of research and development. Wang was to get US$670 million in stock. Shareholders sued and won on a technicality. A federal judge ruled the executives had to return almost half their shares.

Bugs found in W2K service pack

Microsoft has quietly released the first downloadable version of Windows 2000 Service Pack 1 (SP1), which has been delayed since June. But SP1 has added its own bugs.

Early users have reported that SP1 breaks personal firewall products such as ZoneAlarm and BlackIce. If you are using one of these programs you'll need to disable them to get online or, in the case of ZoneAlarm, reduce your zone security setting for the Internet to "Medium" (this is in Internet Properties), which isn't a particularly elegant solution.

Weighing in at a hefty 83 MB, this particular version isn't for low-bandwidth users, but there should be a smaller version on Windows Update according to Microsoft.


As a software reviewer, I try not to
gush over programs, but as an NT
administrator, I can't say enough about
AppManager. After testing it for
week, I found the built-in monitor
Monitor. Manage. Marvel.

WindowsNT magazine

Is "awe" too strong a word to describe the industry's reactions to AppManager from NetIQ? Well, some feel its ability to manage and monitor the performance and availability of your Windows NT® and 2000 systems and applications is nothing short of miraculous. And in addition to systems and server apps like Exchange, SQL Server, IIS, and Lotus Domino, AppManager even monitors your own in-house applications. | Reviewers, analysts, even customers like **Microsoft, Nasdaq,** and **Shell Services International**— all speak of the management magic AppManager can do. To find out exactly what makes AppManager so, well, *marvelous*, visit us at www.netiq.com/moreinfo or call 02 99591973.

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New DVD gear available here

Hitachi's new DVD RAM (read or write) and ROM drives and media – part of the company's new DVD World concept – is now available in Australia.

The drives include the GF-2000 second generation 9.4G DVD-RAM drive and the new 12X DVD-ROM drive type GD-7500. Hitachi has also brought out the GF-2050, which is a SCSI drive.

The devices accept standard 12cm DVD data disks or the new 8cm Video DVD media from Hitachi.

With a total capacity of 9.4G, the DVD-RAM drives provide double the capacity of earlier models. This new generation of DVD-ROM and RAM drives from Hitachi conform to the DVD Forum standard used by other DVD device manufacturers such as Panasonic and Toshiba.

Hitachi drives provide twice the capacity of earlier models

Hitachi's new DVD media comes categorised according to type of use (such as data or video), size, capacity or by fixed or retrievable cartridge mounting.

Cosmetic changes are supported by some general enhancements

Media for data use comes in 12cm disks with either 9.4G (double sided) or 4.7G(single sided) capacity. The larger capacity DRM94F is supplied in a Type 1 cartridge that is not removable and as such cannot be played in the new DVD-ROM drives. The DRM47R, which is a Type 2 media, is removable.

SGI and Intergraph to merge

Struggling graphics box vendor Intergraph is set to merge with SGI in an effor to bolster the two companies' flagging product ranges.

According to Intergraph Australia executive Gerry McGinty the merger wil take place in two weeks time.

"Intergraph are getting out of the hardware business. All our products in the futur will be branded SGI. The official announcement will come soon," McGinty said. Bot companies have struggled to capture market share in the Windows 2000 server an workstation market. Intergraph failed because of poor marketing and SGI faile because it tried to market an expensive proprietary Windows NT/2000 workstation.

The Australian subsidiaries of Intergraph and SGI have pledged that customers an resellers would have no problems with the merging of product lines between the tw companies. "We are working together to ensure the interests of customers and reseller are looked after, and will ensure that customer's businesses are not disrupted by thi move," said Lee Finniear, managing director of Intergraph Australia, and Bill Trestrail managing director of Silicon Graphics, in a joint statement.

Intergraph recently flicked its intellectual property for the Zx10 high-end NT workstations and servers to SGI.

SGI plans to absorb the technology in its 230, 330 and 550 NT Visua Workstations, while Intergraph becomes a reseller of the re-badged SGI products.

Further details of the alliance will be released later this year.

Pret a porter Palm jobs

Palm has introduced a new line of hand-held computers that will for the first tim be available in different colours and contain more user-friendly features.

Seeking to broaden its market beyond its core base of high-income and tech nically sophisticated consumers, Palm is positioning its latest hand-held device as a func tional fashion accessory. The new line, called the Palm m100, has plastic casings in fiv different colours that are interchangeable.

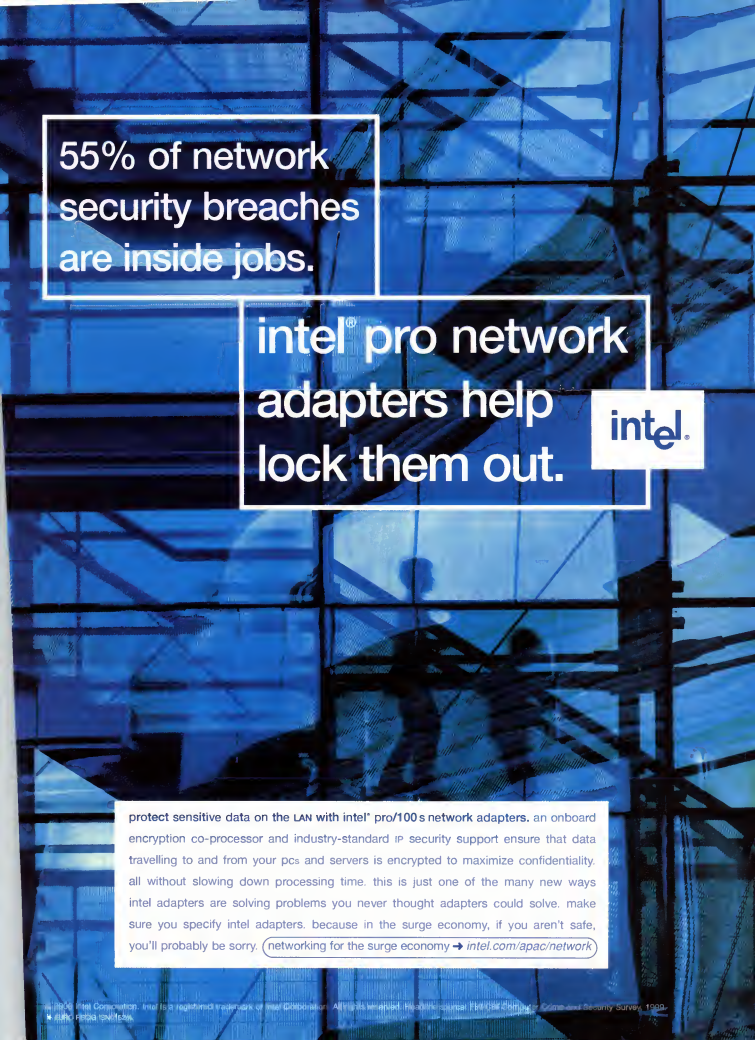
"You can change the colour with your mood, your wardrobe or the day of the week, said Palm product manager Tim Twerdahl. Each additional casing will sell for US$19.95

The cosmetic changes are supported by some general enhancements including a ne Note Pad application that works with handwriting-recognition software so that users ca jot down notes in plain writing and have the data stored electronically.

The new Palm, which at a price of US$149 is the company's cheapest hand-he computer, also omits some of the most corporate features from earlier models, li an expense tracking program. The next least-expensive Palm handheld computer sells for US$249.

The alarm clock in the Palm m100 has also been tweaked from earlier models so that it has a louder ring that the company says is more suitable for waking a sleeping person than subtly getting some-one's attention during a business meeting.

"What we are really look at is reaching people who, to date, have not bought Palms," said Twerdahl. "We have a very broad target – everyone from students through professionals who are finding their current paper solutions are inadequate."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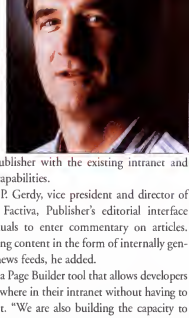
Data retrieval tool adds extra functionality

Greg Gerdy ▶

Factiva is building the capacity to drop Factiva Publisher into executive information portals.



Factiva has married the content of Dow Jones and Reuters with information search and retrieval capabilities and built in customisable content integration features to produce the Factiva Publisher, software.

The product, that was released in early August, takes a three-pronged approach to information retrieval. It provides profiled information or folders to authorised users on corporate intranets, an editorial interface and different toolsets for integrating Publisher with the existing intranet and providing administrative capabilities.

According to Gregory P. Gerdy, vice president and director of product management at Factiva, Publisher's editorial interface allows designated individuals to enter commentary on articles. There is also a way of linking content in the form of internally generated documents to the news feeds, he added.

Factiva Publisher offers a Page Builder tool that allows developers to place news modules anywhere in their intranet without having to write HTML or JavaScript. "We are also building the capacity to drop Factiva Publisher into executive information portals (EIP) or systems such as the Microsoft Digital Dashboard. The company is using Microsoft's Web Part framework to do this," said Gerdy.

The administrative tools allows the intranet managers to monitor what resources are being used by the network users. "From an administrative standpoint this gives network managers the capability to work out delivery times," he added.

The cost of Factiva Publisher depends on what organisations sign up for. Prices can go as low as $10 per seat depending on the volume and folders that are used.

Netscape to plug a worrying gap

Netscape Communications, a unit of America Online, plans t make a patch available so that users can protect themselve from a glitch found in Netscape's browser software that le hackers view or retrieve files on a computer or network.

In early July, programmer Daniel Brumleve outlined on his Wc site a security hole in Netscape's Java distribution, calling it Brow Orifice. He said the hole could allow access to local files after a us opened an e-mail or visited a Web site.

"It's very serious because it's very straightforward to exploit," sa Chris Rouland, director of Internet Security Systems' interr research and development Group, X-Force. "If a hacker implants t malicious Java code on a site, it can infect users. It can read the ent file on a hard drive on the Internet, such as Quicken data, spre sheets, and passwords."

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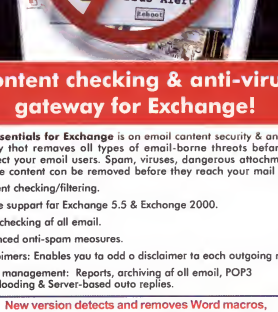

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Office 10 is not Office.NET

The next version of Microsoft Office – currently operating under the codename "Office 10" – is not the first iteration of Office.NET ("Office Dot Net") but rather an update to the familiar Office 2000, with no server-hosting requirement.

Most surprisingly, however, was a recent admission by Microsoft at a financial analysts meeting that realising the Office.NET vision may take a few more iterations of the Office suite. Previously, it was expected that Office 10 would be the last "traditional" release of Office and that future versions of the suite would be available solely online as software services to which users could subscribe. But the company now admits that it will be impossible to abandon its traditional market, and will likely continue to develop desktop versions of the Office suite for the foreseeable future.

Ben Graetz, Office product manager for Microsoft Australia said that a limited number of betas of Office 10 are to be made available to Australian customers at the end of this year.

Scientists pinpoint Internet's Achilles heel

The complex structure of the Internet makes it resistant to errors or failure, but it is also its vulnerability, scientists in the US have reported.

Researchers at Notre Dame University, who have analysed the connections within the Internet, have found that if the networks with the most highly connected nodes are attacked by cyber-terrorists, the attack could fragment the Web into isolated parts.

"The Achilles heel is that the structure has this double feature," said Albert-Lazlo Barabasi, a structural physicist. "Like Achilles, it is very hard to kill it, but if you know something about the system, then you could."

An estimated 3 percent of nodes are down at any given time, but no one notices because the system copes with it.

"The reason this is so is because there are a couple of very big nodes and all messages are going through them," Barabasi said. "But if someone maliciously takes down the biggest nodes, you can harm the system in incredible ways. You can very easily destroy the function of the Internet."

Barabasi, whose research is published in the science journal Nature, compared the structure of the Internet to the airline network of the US. The majority of airports are small, but they are all connected to much larger hubs – cities such as Chicago, Atlanta, New York, and Los Angeles.

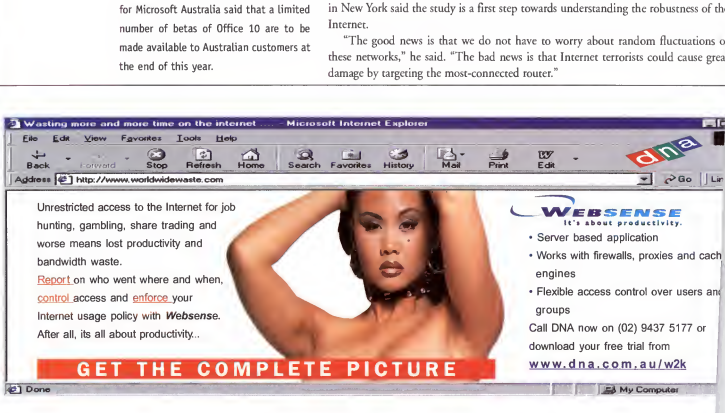
"That's exactly the situation on the Internet: There are a couple of hubs that are crucial to the system," he explained.

These big hubs control the traffic in the system.

If the Internet hubs are taken out simultaneously there would be a serious problem, but Barabasi said the probability of random errors hitting the big nodes is very small.

In a commentary on the research, Yuhai Tu of the IBM TJ Watson Research Center in New York said the study is a first step towards understanding the robustness of the Internet.

"The good news is that we do not have to worry about random fluctuations of these networks," he said. "The bad news is that Internet terrorists could cause great damage by targeting the most-connected router."



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S3 scuttles Diamond Multimedia

Once arguably the most recognised name in multimedia add-on cards, Diamond Multimedia has been quietly shut down.

Instead of selling the graphics-card business as it had originally planned, Diamond Multimedia's owner, S3, said that it had decided to scuttle the operation.

S3 will take a one-time charge in the current third quarter, the amount of which has not yet been determined, a spokesman for the company said.

The shutdown does not extend to FGL Graphics, the professional graphics division of S3, which is headquartered in Germany. In a separate announcement, S3 said that chief financial officer Walt Amaral S3 had left the company to pursue other interests. The Diamond Multimedia name may live on as part of S3's popular Rio player.

"They were shopping it around," including rival board companies like Guillemot, said analyst Jon Peddie of Jon Peddie Associates. "But the only thing they had to sell was brand. S3 itself hadn't come up with any new chips in a while."

Spotting the next virus attack

Computer Associates is currently working on applying predictive technology inherent in its Jasmine ii and Nugents technology to the problem of analysing the threat of attacks from malicious code.

This move will allow network managers to employ a more proactive approach to maintaining system integrity.

Computer Associates International's vice president of security, Simon Perry, said security is a trade-off between security and accessibility. "If you are connected to the network then in some shape or form you can be attacked," he added.

Simon ▶ Perry

Organisations need to be proactive to reduce attacks.

Perry said that organisations have to start moving to the proactive model to reduce attacks. "If you agree that there are always new attacks, the reactive model will always catch you out," he added.

"We have a couple of projects underway today looking at taking the Nugent's predictive technology and applying that to threat analysis – even if you have never seen an attack before," he said.

The problem with using the proactive method, however, is that one can never accurately predict every new attack that is going to come out. "Operating systems, applications, the network vendors are caught out by somebody finding a way of exploiting some new feature," he added.

"People have to realise that security is not a product that you can implement and then tick that it is done. Security is a journey not a destination," said Perry.

Users should not be lulled into a false sense of security when they implement a product. They should also look into educating users on the importance of security.

On the subject of the next malicious code to hit networks worldwide, he said "...expect to see a virus that marries the social engineering of ILoveU and an extremely destructive payload sometime in the next 12 months".

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Unlimited
Using Microsoft RSS to manage hierarchical storage

storage

by: Douglas Toombs

One of the more subtle changes that Microsoft has introduced in Windows 2000 (Win2K) – and yet one of the most significant – is in NTFS. Although NTFS might look the same cosmetically, Microsoft has added new features under the surface that give administrators more capabilities for managing storage on enterprise networks.

Windows 2000 Magazine has covered many of these capabilities, which include encrypting, journaling, and using reparse points. Although reparse points might not seem significant, they enable one of network storage's most advanced features – hierarchical storage. Using hierarchical storage, you can have – in theory – unlimited storage space available to your system at any time. And Microsoft has made the technology fairly easy to set up and administer.

Hierarchical Storage Management 101

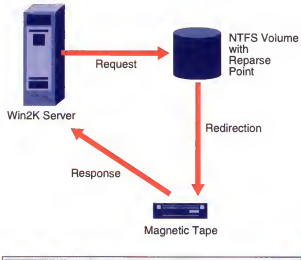
To understand how hierarchical storage works, you need to understand reparse points and how they function in Windows 2000 Server (Win2K Server). Think of a reparse point as a special NTFS object. When an OS process or a user requests a file or directory, a reparse point effectively tells the file system, "Instead of finding that file (or directory) here, try this other location." The file system obeys the instruction and retrieves the file (or directory) from the alternative location. As far as the OS or the user is concerned, the file came from the original location, but it actually resides elsewhere. Figure 1 on page 24 illustrates this file-retrieval process.

UNIX-based OSs have included this capability for years. Reparse points are important because Microsoft wants to compete in large enterprise environments, and one means of competing in the enterprise market is the ability to provide hierarchical storage services. Organisations both large and small simply can't afford (and don't need) to keep all their historical data online forever. Therefore, a product such as Remote Storage Service (RSS) is a welcome addition to Win2K Server.

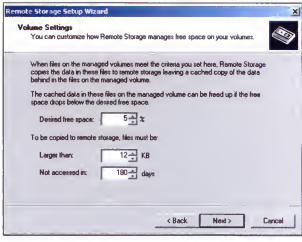
If you're unfamiliar with hierarchical storage, the concept is simple, so I'll start with a quick primer. Most organisations never seem to have enough online storage. Although disks are relatively cheap today, servers always seem to fill up no matter how much storage administrators add. Therefore, many organisations are now backing up historical data to tapes – removing the data from online storage, then storing the tapes permanently in case the organisation ever needs the data again. Obviously, this manual process is time-consuming, especially months later, when someone needs to access the historical data.

Hierarchical Storage Management (HSM) automates the entire process. HSM defines two types of storage systems, which I call *online storage* and *nearline storage*. Online storage typically comprises hard disks and other relatively high-cost media that can return data almost instantly. Nearline storage,

Figure 1: ▶ File Retrieval via the Reparse Point



Screen 1: ▶ Defining RSS operating parameters



such as a magnetic tape, is media that costs less than online storage but is usually slower to return data. For HSM to function, all storage media must be readily accessible without requiring human intervention. Because typical tape backups (i.e., offline storage) require hand-mounting, offline storage doesn't play a role in HSM.

Microsoft's preferred terms for online storage and nearline storage are *local storage* and *remote storage*, respectively. Because Microsoft uses these terms, I use them throughout the remainder of this article.

HSM products can look at files stored in an NTFS file system, determine which files need to move from local storage to remote storage, then move them – all without requiring human intervention. Microsoft has licensed technologies from VERITAS Software and bundled them with Win2K Server as RSS.

Remote Storage Service

RSS is an important addition to Win2K Server. Essentially, RSS keeps an eye on your local media (i.e., disks) and moves the data if the media become too full. RSS moves (i.e., migrates) the data to remote storage, then puts an NTFS reparse point on the local media in place of the file. For example, suppose you have 8GB of local storage and 24GB of remote storage available on a 12/24GB DAT. In theory, as far as your end users are concerned, you have 32GB of data available because when a user requests a migrated file, RSS retrieves the file from remote storage and restores it to the appropriate location on local storage. If you have the right equipment, RSS is fairly easy to set up and lets you increase your storage capacity without moving data completely offline.

Removable Storage

Although the storage media that RSS uses are typically called *remote*, they're also usually removable. For example, the physical media (i.e., tapes) of an autoloading DLT library are removable. However, for RSS to work properly, you must not remove any media that you use in remote storage. And you can't use every type of removable storage as remote storage.

RSS doesn't work with just any tape drive. Microsoft's RSS documentation states that it "supports all SCSI class 4mm, 8mm, and DLT tape libraries." As far as Microsoft is concerned, a library can be an automatic multimedia multidrive device or a manually operated single-drive device. Microsoft doesn't support quarter-inch cartridge (QIC) tape libraries or optical disk libraries – an unfortunate exclusion because optical media is becoming quite prevalent. (If you need the capability to migrate to optical storage, you might want to take a look at other HSM products on the market.)

Setting Up RSS

Assuming that you have a compatible tape drive, you can begin working with RSS immediately. If the application isn't already installed on your server, open the Add/Remove Programs Control Panel applet and select Add/Remove Windows Components. Choose the Remote Storage option, then let Win2K install RSS. For this article, I ran Win2K Server on a Compaq machine with an external-SCSI HP SureStore 12/24GB DAT drive. If you have a working SCSI tape drive (or tape library) on your Win2K server, you can start using RSS by selecting the Remote Storage option from the Start menu's Administrative Tools group.

When RSS starts, Win2K takes you through the Remote Storage Setup Wizard, which tells you whether your tape drive will work. If you don't have a compatible drive, the wizard fails at its first step, when it attempts to detect compatible media. If the wizard's first step completes and you reach the second step, your tape drive will work.

The Remote Storage Setup Wizard asks you which NTFS volumes you want to manage. In RSS parlance, a managed volume is simply an NTFS partition that RSS monitors and migrates files from, if necessary. You can manage any NTFS volumes on your system, but you can't manage FAT volumes (including FAT32) because they don't support reparse points. Select the volumes you want to manage, then click Next to proceed to the Volume Settings step, which Screen 1 shows.

You perform about 80 percent of your RSS configuration in the Volume Settings step. In this step, you define – based on the volumes you selected in the first step – the parameters

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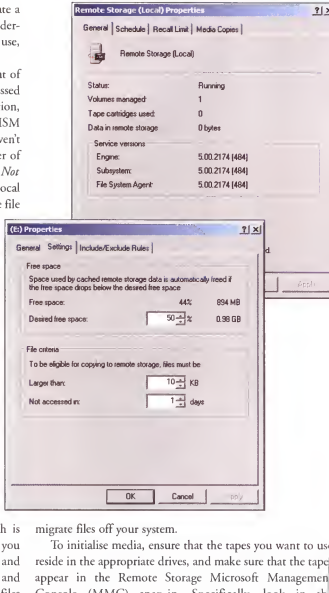
Screen 2: ▶ Modifying RSS properties

Screen 3: ▶ Modifying managed volume properties



that RSS uses to determine whether and when to migrate a file from local storage to remote storage. To better understand the migration process and decide which values to use, you need to understand migration logic.

RSS monitors your managed volumes for the amount of remaining free space and for files that users haven't accessed for a while. Each monitoring process has a separate function, and the processes work together to provide a complete HSM solution. First, the system monitors which files users haven't used recently. If users haven't accessed a file in x number of days (a value you denote in the Volume Settings step's *Not accessed in: __ days* field), RSS *premigrates* the file from local storage to remote storage. In other words, RSS copies the file to remote storage (i.e., your tapes) but doesn't yet remove the file from local storage (i.e., your hard disks). Instead, RSS flags the file as premigrated.

RSS fully kicks in only when you start running out of space on your volume. When your volume's free space drops below x percent (which you denote in the *Desired free space* field), the RSS process starts removing premigrated files from your local storage and replacing them with NTFS reparse points. Therefore, if your environment has a sudden surge in disk usage, the RSS process doesn't need to worry about migrating files to make more space. Files have already premigrated, so to keep up with the sudden increase in disk space requirements, the RSS process needs only to remove the actual file from local storage and put a reparse point in its place. This process occurs quickly, so RSS can promptly cope with sudden increases in disk space requirements.

The final configurable parameter in the Volume Settings step is the minimum file size for migration. Microsoft's default value for this field is 12KB, which is probably suitable for most environments. However, you might want to take a full inventory of your system's files and determine how many files of each size your system has and what the average file size is. Obviously, migrating 1KB files to tape probably doesn't make sense because of the performance overhead involved with moving such a small file, but you'll need to make that judgment for your environment. Choose a suitable number for your environment, then press Next to go to the wizard's next step.

In the Media Type step, the RSS wizard simply wants you to specify the type of media you want to use for remote storage. (You can't use the same tape drive you use for routine backups because the tapes that RSS uses must always be mounted.) After you make your selection, press Next to complete the wizard.

Initialising Media

RSS is now fully configured and ready to begin monitoring your volumes and migrating data as necessary. However, your work with RSS isn't finished. All RSS functions are available and operating, but until you initialise media and mark them for remote-storage use, RSS won't be able to migrate files off your system.

To initialise media, ensure that the tapes you want to us reside in the appropriate drives, and make sure that the tape appear in the Remote Storage Microsoft Managemen Console (MMC) snap-in. Specifically, look in th Removable Storage, Physical Locations folder under you tape system's drive designation. Although Removable Storag sees that you have tapes in your system, Removable Storag doesn't presume that it can use them for remote storage. T make the tapes available to RSS, simply copy the icons th represent the media you want to use to the appropria media type listed under Media Pools, Free. This actio informs Win2K Server (and RSS) that these tapes are ava able for any purpose. Win2K initialises the tapes, and RSS ready to run.

Modifying Managed Volumes

Following implementation of the application, you mig want to fine-tune RSS's operating parameters, as well as t volumes you've told RSS to manage. You can easily mod these items' properties through the Remote Storage MM snap-in.

To modify general RSS properties, right-click Rem

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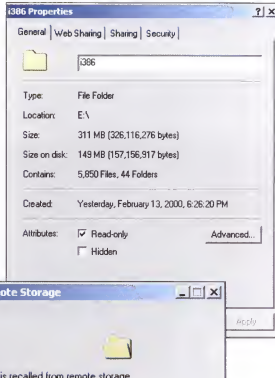
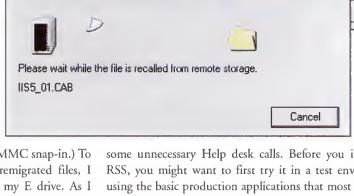
Screen 4: ▶ Viewing migration statistics



Screen 5: ▶ Waiting for file retrieval



Storage in the Remote Storage snap-in's left pane and select Properties. The Remote Storage (Local) Properties page, which Screen 2 on page 26 shows, offers four tabs on which you can monitor how much data has migrated to remote storage, change the time and frequency that the service runs (Microsoft's default is daily at 2:00 a.m.), and modify media properties.

After you set the properties for a specific managed volume, you might decide that you want to change these properties at some point in the future. To change properties for a managed volume, select Managed Volumes in the Remote Storage snap-in's left pane, right-click the volume you want to modify in the right pane, then select Properties. As Screen 3 on page 26 shows, you can modify individual properties for each managed volume, so you can set different types of migration parameters for different types of data. In my example, I modified my E drive's properties to ensure that 50 percent of the volume is always available and that any files larger than 10KB (and that no one has accessed for 24 hours) can migrate.

Testing RSS

After I enabled the configuration you see in Screen 3, RSS began to quickly premigrate files off my system and onto tape. (Remote Storage logs its activities in the event log, which you can view through the Event Viewer or the Remote Storage MMC snap-in.) To force RSS to completely migrate the premigrated files, I copied about 500MB of new data onto my E drive. As I expected, storage on the drive dipped below the 50 percent threshold during the copy process but came back up as the RSS process removed the premigrated files from my system and replaced them with appropriate NTFS reparse points.

To ensure that RSS worked successfully, I decided to find some files that had completely migrated off my local storage (i.e., not just premigrated) and bring them back. To find a migrated file or directory, simply look at the migrated item's Properties page, which Screen 4 shows. If RSS has moved the file, you'll see distinctively different readings in the *Size* and *Size on disk* values. (As you can see in my example, nearly half of my system's \i386 directory had migrated to tape.) After I found a migrated file, I copied it back to my desktop. Win2K began the typical copy process, but RSS quickly intervened and presented the dialog box that Screen 5 shows, asking me to wait while the system retrieved my file from remote storage.

Moving a 5MB file off a 12/24GB DAT took about 1 minute. (Most of that time probably consisted of the drive spinning the tape up to speed and finding the right location for the file.) One minute isn't terribly long, but if you decide to provide RSS to your users, you need to consider the service's inherent delays. If desktop applications timeout while RSS is retrieving archived files, your users will be making some unnecessary Help desk calls. Before you implemen RSS, you might want to first try it in a test environment using the basic production applications that most users use.

Not a Backup Substitute

Although I haven't discussed backups, you need to under stand that RSS is *not* a substitute for routine system backups Because RSS doesn't migrate all your files (and won't migrat your \winnt directory), you can't use the service as a suitabl backup in the event of a complete system failure. Routin backups are still necessary.

The ability to always keep archived data online appealing and can eliminate some of the mundane tasl that administrators perform. Particularly, the availabili of a potentially unlimited amount of storage at any give time is quite gratifying. HSM technologies, which prev ously presented a significant add-on cost for any ente prise, are now free with Win2K Server – a great move Microsoft's part. ❑

ABOUT THE AUTHOR

Douglas Toombs is a contributing editor for Windows 2000 Magazine, the owner of NetArchitect Consulting, and an MCSE, Compaq ASE, and a Novell CNA. He is a coauthor of Mastering Windows 2000 Server (Sybex). You can reach him at doug@netachitect.com.

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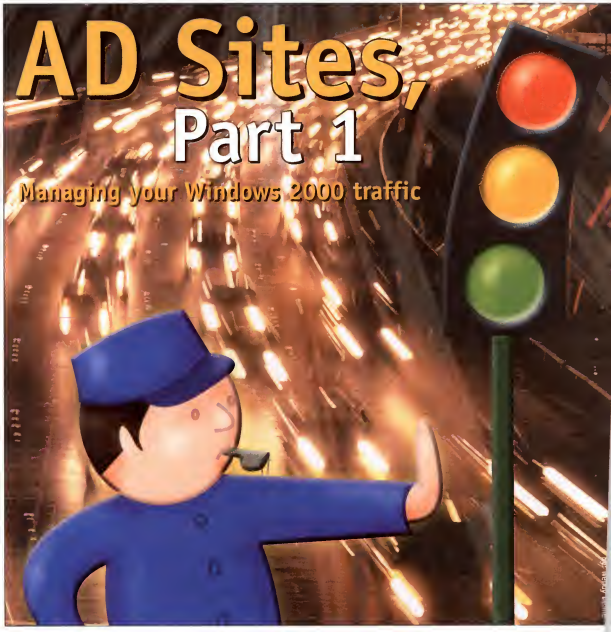


AD Sites, Part 1

Managing your Windows 2000 traffic

by: Sean Deuby

Windows 2000's (Win2K's) Active Directory (AD) has garnered the most technical attention of all the Win2K features. Despite this focus, users haven't given as much attention to AD's sites feature compared with the new Win2K domain structure and the Global Catalog (GC). Although Win2K's tasks might be overloading you, you should learn about AD sites because they can make a huge difference in how Win2K affects your corporate network. After you learn how to use AD sites to manage replication over your Win2K network, you'll see that A sites deserve the spotlight.

The AD Site Concept

Microsoft introduced AD's sites feature in Win2K to solv Windows NT 4.0 problem. The physical network topolo for large corporate networks resembles islands of hi connectivity (i.e., the LAN in an office complex) that ocean of lower connectivity (i.e., WAN circuits connect

islands) surrounds. In comparison, NT 4.0 doesn't recognise the physical network topology underlying its architecture and can't directly control WAN usage. NT Server 4.0 uses only its domains and domain controllers to control replication across a network, so the NT Workstation 4.0 client, with help from WINS, chooses which domain controller the client authenticates with, depending on its domain.

When your domain spans several WAN circuits, you can have clients that authenticate to remote domain controllers, a situation that causes slow or failed resource access and slow or failed network logons. Utilities such as Setprfdc can resolve these problems, but the logical nature of NT domains often conflicts with the network topology's physical nature. Microsoft designed AD sites to help the OS understand the physical network topology so that Win2K can define highly connected islands and more intelligently manage traffic.

Microsoft defines a site as a set of IP subnets that have good bandwidth connections. Sites typically have well-connected computers, although well-connected computers aren't a requirement. Several factors (i.e., WAN bandwidth and circuit latency) influence connectivity, and the definition of well-connected computers might vary among companies. Therefore, I can't give you a standardised site boundary definition that you can apply to every circumstance in your company's network. Also, whenever I use the terms *computer* and *server*, I'm referring to Win2K systems. NT 4.0 servers aren't site-aware and never will be. However, you can use the Directory Service (DS) client on the Win2K distribution media to make Windows 9x clients site-aware.

You might find it difficult to distinguish sites from domains. The difference between the two is that sites represent the network's physical structure and domains represent the region's or organisation's logical structure. You can have several domains in a site, which might be a complicated scenario to manage, or a domain that spans many sites.

Sites serve three functions. First, sites control AD replication more precisely than domains can. Second, sites play a major role in how AD-aware clients locate a domain controller for network authentication. Finally, sites localise client-server resource selection for AD-aware applications (for example Win2K's Dfs).

Managing Replication

A good AD site design manages replication to a finer degree than domains alone can. Uncompressed replication between domain controllers inside a site (for example your entire network if you don't create sites beyond the original site Default-First-Site-Name) occurs every 5 minutes. Also, administrators can't schedule replication between domain controllers inside a site. AD assumes that good connectivity and reliability exist between domain controllers inside a site and therefore makes low latency a higher priority than paring down network utilisation.

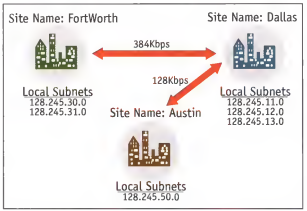
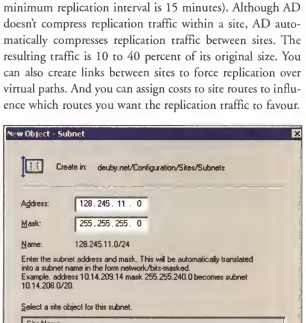


Figure 1: Network and WAN topology of a Texas company

When you create AD sites, you can control and configure replication in several ways. You can define how often and when you want replication to occur between sites (the minimum replication interval is 15 minutes). Although AD doesn't compress replication traffic within a site, AD automatically compresses replication traffic between sites. The resulting traffic is 10 to 40 percent of its original size. You can also create links between sites to force replication over virtual paths. And you can assign costs to site routes to influence which routes you want the replication traffic to favour.



Screen 1: Viewing the New Object Subnet dialog box

Screen 2: ▶ Moving a server

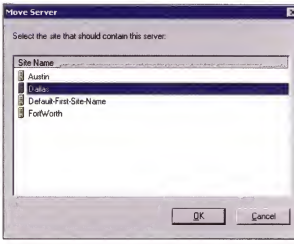
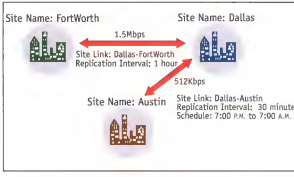


Figure 2: ▶ Site links and replication control between sites



Creating AD sites. To create an AD site, you must create the site object, add subnets to it, move preexisting servers into the site, use site links to connect it to other sites, and customise replication between the sites. To show you how to create sites, I'll start with a simple example and build on it. Figure 1 shows on page 31 a fictitious Texas company that has offices in Dallas, Fort Worth, and Austin. Dallas is the company's WAN hub for the other two locations. For this example, I call each location and its computers a site. Each site has several IP subnets on an Ethernet LAN topology, so sites have well-connected IP subnets. The company has only one domain, and each site has several Win2K domain controllers.

To create the site object, right-click the Sites container on the Active Directory Sites and Services Microsoft Management Console (MMC) snap-in from the Start Menu's Administrative Tools list and select *New site* to launch the New Object-Subnet dialog box, which Screen 1 on page 31 shows. Enter the site name, and don't use spaces. I recommend that you follow DNS naming conventions because you store site names in DNS SRV records. Select the site link object that this site will use (i.e., the path that will connect this site to other sites), and choose OK. A message will tell you that to complete the site definition, you must use site links to link the new site to other sites, add subnets to the new site container, install domain controllers or move them into the site, and select the licensing computer for the site.

Before you can add subnets to the site, you must add your subnets to AD in the Subnets container. Launch the Active Directory Sites and Services snap-in, right-click the Subnets container, and select New Subnet. For each subnet you want to define, enter the subnet address and subnet mask that defines the subnet's size. Assign these parameters to a site, and click OK.

You next move servers into the appropriate sites. Right-click a server name and select *move* from the context menu. In the resulting Move Server dialog box, choose the destination site, as Screen 2 shows. You don't need to reboot your servers after you move them. If you create new servers after you moved your initial servers and the new servers have IP addresses that match site subnets, the new servers automatically register in the site when they join the domain. If your new servers don't have IP addresses that match site subnets, the servers fall into the Default-First-Site-Name site.

When you define distinct sites instead of leaving your computers in Default-First-Site-Name, you take the first step in managing replication. You ensure that AD-aware clients will preferentially chose a domain controller in their local office location when one is available, which keeps logon authentication traffic local to each site. You also relax the replication interval between these locations from every 5 minutes to the default interval of 3 hours and compress the replicated data between locations.

The example Texas company has network bandwidth difficulties that require a more detailed site configuration. AD replication traffic is always heavy on the network between Dallas and Fort Worth, so you want to minimise this traffic impact on the WAN's limited bandwidth between the tw sites. Also, the Dallas-Austin AD replication traffic is heav during the day, but not at night because the office closes 7:00 p.m. You can use several site features to minimise th Win2K replication traffic, but before you learn how to us them, you need to understand the concept of site links.

Configuring site links. Site links are virtual circui (VCs) that exist between sites for Win2K replication traffi Site links typically control replication between two membe sites. You can use two transports to create site links – SMT and remote procedure call (RPC) over TCP/IP (whic appears as IP in the snap-in). Ninety-five percent of your si links will use the IP transport. Site links use SMTP transpo for situations such as transporting traffic over highly unre able links to a remote site, or transporting over a firewall th doesn't pass RPC traffic on ports 137 and 139.

Unlike a real telecommunication circuit, a site link c connect more than two sites. Therefore, site links are use when you want all the sites that use the link to have the sa intersite replication characteristics.

DEFAULTIPSITELINK, which Screen 3 on page shows, is the default site link for IP connections and acts a shared site link because when you don't add explicit lin all sites use it.

To configure site links in the AD Sites and Services sn in, click the plus sign that is next to the Inter-Site Transpo container (or double-click the container) to view the IP SMTP containers. Right-click the IP container, then se

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Screen 3: ▶ Viewing DEFAULT-IPSITELINK

New Site Link. Screen 4 on page 36 shows the New Object-Site Link dialog box that appears. You next create the Dallas-FortWorth site link in a point-to-point configuration. You can also add Austin and Default-First-Site-Name to the list of sites that use this site link. However, adding Default-First-Site-Name is redundant to DEFAULTIPSITELINK because every new site uses DEFAULTIPSITELINK by default. If you add all the sites to the link that you create and don't change cost parameters or the schedule, the link will act like DEFAULTIPSITELINK. Name a site link to identify the sites that it links (name the hub site first, which is Dallas-FortWorth in the example) to ensure that the site links line up in a readable manner in the Administration MMC snap-in.

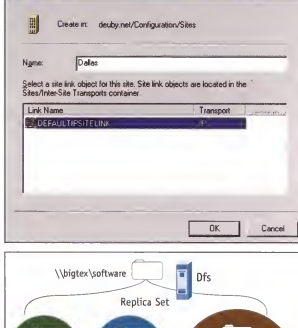
Customising replication. After you add site links, you can customise replication between the sites to tailor the replication to each location's business needs. To customise replication between the sites for the Texas company, right-click the Dallas-FortWorth site-link object under the IP container of the Inter-Site Transports container to edit the properties of the Dallas-FortWorth site link. The site-link Properties dialog box looks the way it did when I originally created the link, except I added three controls – cost, replication interval, and replication schedule.

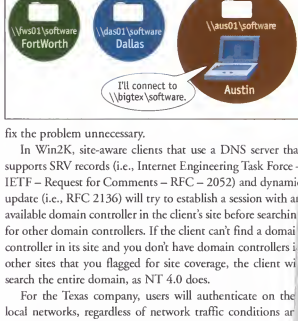
Figure 3: ▶ Local client/server resource selection

You use the replication control on the Dallas-Fort Worth Properties dialog box to decrease the replication interval between Dallas and Fort Worth from its default of 3 hours to 1 hour. The replication will be more frequent but smaller, and you reduce the amount of time it takes a change to propagate across the enterprise between the sites. To avoid the heavy Dallas-Austin Win2K replication traffic during daylight hours, configure the Dallas-Austin site link to prevent replication between 7:00 a.m. and 7:00 p.m. You can also decrease the replication interval from 180 to 30 minutes so that changes that occur at the other sites before 7:00 a.m. will replicate to Austin right away. Figure 2 on page 32 shows the final site design with the site links that I created for theTexas company.

Client-Domain Controller Selection

Site designs influence the site-aware client's Win2K domain controller selection for network authentication. (Windows 2000 Professional – Win2K Pro – or Win9x with DS are site-aware clients.) In NT 4.0, a client chooses a domain controller from the domain that the client's account belongs to. The list of domain controllers that WINS returns influences the domain controller choice, but you can't guarantee that the client will receive the network's closest domain controller. For example, if your domain exists on the US East Coast and in Europe, a server in Frankfurt, Germany, might perform domain authentication for New York clients. Until you reset the New York server's secure channel, the client requests need to traverse the Atlantic Ocean twice to gain access to a New York resource. You can use several utilities (for example Setprfdc) to manually force a selection, but a good Win2K site design can make using a utility to continually monitor and





fix the problem unnecessary.

In Win2K, site-aware clients that use a DNS server tha supports SRV records (i.e., Internet Engineering Task Force - IETF – Request for Comments – RFC – 2052) and dynami update (i.e., RFC 2136) will try to establish a session with a available domain controller in the client's site before searchin for other domain controllers. If the client can't find a domai controller in its site and you don't have domain controllers i other sites that you flagged for site coverage, the client wi search the entire domain, as NT 4.0 does.

For the Texas company, users will authenticate on the local networks, regardless of network traffic conditions ar domain controller speeds. A Dallas client will always choose Dallas domain controller for its network authentication, ar Austin users won't accidentally use the congeste Dallas-Austin circuit. The Win2K client's domain controll selection process is complex, so I'll save the details for a futu article. (For more information about domain controller sele tion, see Microsoft's Windows 2000 Advanced Server He Files at http://www.microsoft.com/windows2000/dow loads/otherdownloads/helpfiles/adserver.asp?lang=en.)

Localising Client/Server Resource Selection

Site designs also influence local resource selection AD-enabled client/server applications. Dfs demonstrates t site feature well because Dfs understands sites. Dfs

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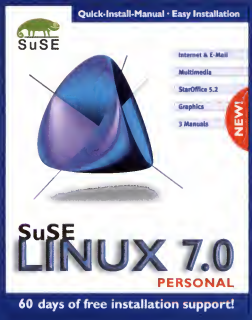

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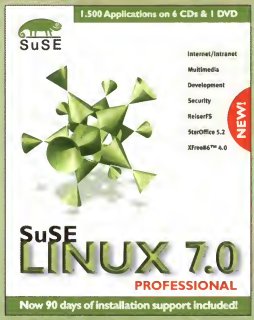

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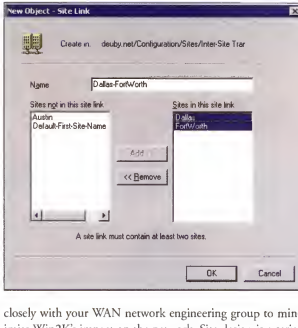
Screen 4: ▶ Creating the Dallas-FortWorth site link

administrators create a logical folder hierarchy of easy-to-remember names that map to physical Uniform Naming Convention (UNC) names (i.e., \\server\share) across the network. The Dfs replica sets feature lets one logical folder map to several UNC names across your network; each UNC name hosts identical data. If the servers hosting the UNC names (i.e., replica servers) are Win2K servers that registered in the same site as the site-aware client, the client will favour a replica server in its site.

For example, an Austin user in the fictional Texas company wants to download software from a network share named \\bigtex\software. This server's \software share is a Dfs replica set, with replicas in Fort Worth, Dallas, and Austin. The Austin Win2K Pro user who connects to \\bigtex\software will set up a session with \\aus01\software, as Figure 3 on page 34 shows. This example demonstrates how a site-aware client can incorporate AD sites into its client/server application design to connect to a generic UNC name. Win2K directs the client to an application server at the client's site.



Plan Your Site Design

A well-planned site design will provide immediate benefits to your Win2K deployment, especially when you have a congested network. When you plan your site design, work closely with your WAN network engineering group to minimise Win2K's impact on the network. Site design is a series of compromises and decisions that you must make, so before you start creating your sites, you need to dig deeper into this subject. Next month, I'll cover advanced topics in site topology and design, so stay tuned. ❑

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How DNS

by: Gary Kessler

As a systems administrator, you might be responsible for connecting your company to the Internet, possibly for the first time. But before you can do so, you need to understand the basics of Internet addressing, find out how to get a Web address, and learn how to register your domain name. I will help you find resources for obtaining IP numbers and registering your domain name and provide practical information about DNS and its associated tools.

Obtaining Names and Addresses

The Internet Assigned Number Authority (IANA–http://www.iana.org) was historically the organisation that doled out names and addresses. However, in 1993, the Nation Science Foundation (NSF) awarded to Network Solutio Incorporated (NSI–http://www.networksolutions.com) 5-year contract that authorised NSI to operate t InterNIC (http://www.internic.net) name-registration s vice. At that time, InterNIC was the place that most pe ple went to for a network identifier(NET_ID) or a doma name in the .com, .org, or .net namespace. Wh InterNIC assigned your IP address, you owned the addr and could keep it even if you changed ISPs. Today, t process of obtaining addresses and of registering dom names has changed.

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works

DNS resources and tools to help you get connected

signs IP addresses and hasn't done so since about 1997. In e Western Hemisphere and some parts of the African ntinent, the American Registry for Internet Numbers RIN-http://www.arin.net) is now the IP number author-. The size of Internet routing tables was becoming manageable, so several years ago ARIN organised unused dress space into Classless Inter-Domain Routing (CIDR) dress blocks. ARIN assigns the CIDR address blocks, in rn, to ISPs or other regional number authorities, such as seaux IP Européens (RIPE–http://www.ripe.net) in rope and the Asia Pacific Network Information Centre PNIC– http://www.apnic.net). If you're in the United tes, you need to coordinate with your ISP to obtain an IP NET_ID address from ARIN.

More than 50 percent of all possible Class C addresses are still available, but because the address supply is rapidly diminishing, getting a full Class C address is difficult. Instead, ISPs and ARIN distribute small address blocks and assign NET_IDs with as few as eight host addresses. IP number authorities assign the address blocks by using variable-length subnet masks (VLSMs), which provide a method of implementing classless addressing. A full description of VLSMs is beyond the scope of this article, but the sidebar "Subnetting and Variable-Length Subnet Masks" describes the motivation for using VLSMs and gives a VLSM example.

Listing 1: ▶ Example Zone File for the Example.com Domain

```
example.com.  IN SOA dns.example.com.  dnsowner.example.com.  (
        19991005  ;  serial # (date format)
          10800   ;  refresh (3 hours)
           3600   ;  retry (1 hour)
         604800   ;  expire (1 week)
          86400)  ;  TTL (1 day)
example.com.  IN NS  dns.example.com.
        IN NS   ns1.ispexample.net.
example.com.  IN MX  20  mail.example.com.
        IN MX   40  mail.ispexample.com.
dns.example.com.        IN A      192.168.210.2
mail.example.com.       IN A      192.168.210.4
www.example.com.         IN A     192.168.210.5
ftp.example.com.        IN CNAME  www.example.com.
```

Listing 2: ▶ Example Reverse Lookup File for the Example.com Domain

```
210.168.192.in-addr.arpa. IN SOA dns.example.com. dnsowner.example.com.
        (19990930   ; serial # (date format)
         10800      ; refresh (3 hours)
         3600       ; retry (1 hour)
         604800     ; expire (1 week)
         86400)     ; minimum TTL (1 day)
210.168.192.in-addr.arpa.  IN NS   dns.example.com.
        IN NS   ns1.ispexample.net.
4.210.168.192.in-addr.arpa.    IN PTR    mail.example.com.
5.210.168.192.in-addr.arpa.    IN PTR    www.example.com.
```

How can a company with several hundred systems operate with a mere handful of IP addresses? Companies might have many users, but generally they have only a few servers that require publicly visible IP addresses. Increasingly, organisations use private IP addressing internally and assign a public IP address to public servers. Companies might use the Internet Engineering Task Force (IETF) Request for Comments (RFC) 1918 private addresses or Network Address Translation (NAT) to statically map the server's public address to an internal private address. When a client system communicates with the Internet, NAT dynamically and temporarily assigns the client a public address. If the number of clients that need addresses exceeds the number of available public addresses, Port Address Translation (PAT-aka NAT overload) provides the addresses. NAT and PAT address management occur transparently at the router or NAT server. To learn more about current address assignments, visit John Crossley's IP Network Index (http://www.ipindex.net/), which cross-references IP Class A, B, and C network numbers with network names.

Registering domain names in the Internet's commercial era. The NSF's contract with NSI expired in April 1998. Unfortunately, no one planned how to handle domain name requests after that date, so NSF has extended NSI's contract several times, most recently through September 2000. In 1998, the Internet Corporation for Assigned Names and Numbers (ICANN – http://www.icann.org) began creating a fair and efficient domain-name-registration system. Many factors influenced the formation of ICANN, and you can find a good description of its history and evolution at the National Telecommunications and Information Administration (NTIA) Web site (http://www.ntia.doc.gov/ntiahome/domainname). Although NSI remains the sole administrator of names in the .com, .org, and .net namespace, many companies, such as America Online (http://www.aol.com), Internet Names WorldWide (http://www.internetnamesww.com) and register.com http://www.register.com), can register names in that space. You can find a list of all accredited name registrars at the ICANN Web site.

DNS Internals

DNS is a distributed database that contains host, mail server, name server, and other domain information. You must maintain a primary name server and at least one secondary name server for every Internet domain. When a client system on the Internet needs to find a server's IP address (for example a reader of this article surfing to http://www.win2000mag.com or sending e-mail to gkessler@symquest.com), the client sends a DNS query to its local name server. If the local name server doesn't have the necessary target server address information, the local name server sends a query to one of 13 well-known root name servers on the Internet. The query then proceeds to one of the target domain's name servers for final resolution. Many ISPs provide primary and secondary DNS service; others provide only secondary DNS service and require the customer to host the primary name server.

Examining DNS file structure will help you understand the name-lookup process. DNS information resides in simple text files called zone files, which contain information called Resource Records (RRs). The most common RRs are

- Start of Authority (SOA) – denotes the primary name server for a domain and a few additional administrative items
- Address (A) – supplies a host name's IP address
- Canonical Name (CNAME) – provides alias host names so that you can associate more than one host name with an IP address
- Pointer (PTR) – associates a host name with an IP address and performs reverse name lookups
- Mail Exchanger (MX) – defines

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Subnetting and variable-length subnet masks

IP addresses are 32 bits long. The length of the network identifier (NET_ID) part of the address determines an IP address classification. Class A, B, and C addresses have 8-, 16-, and 24-bit NET_IDs, respectively. For routing purposes, IP devices such as hosts or routers must separate the NET_ID from the host identifier (HOST_ID) portion of the address. Subnet masks perform this separation.

Subnet masks are usually a string of 1s that denote the number of bits of the address that forms the NET_ID. A Class A address, for example, has an 8-bit subnet mask, which is written 255.0.0.0. Class B and Class C addresses use the subnet masks 255.255.0.0 and 255.255.255.0, respectively. Subnet masks can also segment the HOST_ID. Some sites use the HOST_ID to create a subnetwork identifier and smaller host identifier.

In the past several years, IP address depletion has become a problem. Address depletion occurs not only because so many new networks exist but also because IP address authorities are inefficiently assigning classful IP addresses. A site requiring 500 addresses, for example, might receive an entire Class B block of more than 65,000 addresses.

To solve this problem, Internet address administrators have adopted variable-length subnet masks. VLSMs allow NET_IDs of lengths between 8 and 30 bits. (Subnet masks don't allow lengths of 9, 15, 17, 23, or 25 bits because they look like single-bit subnets.) VLSMs build flexibility into the IP addressing system, and ISPs can efficiently assign address space.

For example, suppose the U.S. Cable Networks, a consortium of US cable TV companies, receives the Class A address 24.0.0.0. Because 24.0.0.0 is a Class A address, you can denote it as 24.0.0.0/8 (the /8 is a shorthand notation for the 8-bit subnet mask 255.0.0.0). Several cable TV company ISPs share the 24-block address. Adelphia Cable Communications (whose ISP service was formerly Hyperion) receives the NET_ID block 24.48.0.0. This block is equivalent to a Class B address, denoted as 24.48.0.0/16. Adelphia's ISP customers, in turn, receive IP addresses from the 24.48.0.0 space and, using VLSM, usually get something smaller than a Class C address space.

For example, Pizzagalli Construction in Burlington, Vermont, receives a block of 64 addresses with the NET_ID 24.48.165.0/26 (i.e., subnet mask 255.255.255.192). The host addresses (the final digit set in the NET_ID) range from 0 to 63. Pizzagalli can't use 0 or 63 because addresses that contain all 0s or all 1s are invalid host addresses.

In a final example, Pension Works in Colchester, Vermont, receives a block of 32 addresses. The company's NET_ID is 24.48.165.64/27 (i.e., subnet mask 255.255.255.224), and the company's host address range is 64 to 95. Usable host addresses are 65 to 94.

Because sub-Class C addresses are common today, you need to understand how subnet masking works. Table A shows the subnet masks that you might use with a Class C address. Assigning sub-Class C addresses preserves address space, but VLSMs are also beneficial because they enable Classless Inter-Domain Routing (CIDR). The American Registry for Internet Numbers (ARIN) introduced CIDR several years ago to reduce the size of Internet routing tables. Customers used to receive assigned IP addresses sequentially. Now ISPs assign IP addresses from a block of addresses. Now our example company, Adelphia Cable Communications, can get all its packets from the 24.48.0.0/16 network. The hundreds or thousands of networks can reference one line in a routing table. After the packets get to Adelphia, the company's routers have to deliver the packets to the correct destination network, but that detail is transparent to the rest of the Internet.

TABLE A: Subnet Masks You Can Use with a Class C Address

Number of Bits in Mask	Subnet Mask	Number of Host Addresses	Notes
24	255.255.255.0	256 (254 usable)	Standard full Class C
25	255.255.255.128	—	Single-bit subnet masks (never used)
26	255.255.255.192	64 (62 usable)	Common
27	255.255.255.224	32 (30 usable)	Common
28	255.255.255.240	16 (14 usable)	Becoming more common
29	255.255.255.248	8 (6 usable)	Becoming common
30	255.255.255.252	4 (2 usable)	Typically used on point-to-point link between ISP and customer
31	255.255.255.254	—	Invalid; results in single-bit HOST_ID
32	255.255.255.255	—	Invalid; no room for HOST_ID

domain's mail systems

- Name Server (NS) – defines a domain's name servers

Listing 1, shows an example zone file mapping host names to IP addresses in the fictitious example.com domain. In this example, the domain hosts Web, FTP, e-mail, and name servers, and the ISP (ispexample.net) hosts the secondary DNS and backup mail server. The IP address in this example is actually a private IP address. So what do all these records mean? The SOA record includes the name of the primary DNS server for this domain and the e-mail addre associated with this domain's nami administrator; note that the reco lists the DNS administrator's e-m with a period (.) instead of the at si (@) because @ has special meaning DNS files.

This resource record also conta

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Figure 1: ▶ Screen output of example nslookup terminal session

five other parameters. First, a serial number identifies the version of this information and tells a secondary server that new information exists to download. Second, a refresh value tells the secondary name servers how often to check for updated information. Third, a retry value tells the secondary servers how often to reattempt connections to the primary server. Fourth, an expire value tells the secondary servers when the information in databases is old and unreliable. And fifth, a Time to Live (TTL) value tells a requester how long you can safely cache the information.

The NS records contain the names of the name servers for this domain. The first server listed is the primary name server because it's the server that the SOA record names. The MX records contain the names of the e-mail servers for this domain. The number in front of the address is the preference value and is most useful when the domain has two or more e-mail servers.

When a remote user sends mail to user@example.com, the remote mail system looks up the MX record for the example.com domain. The remote mailer then attempts to establish an SMTP connection with the mail server that has the lowest preference value. Thus, an organisation can specify multiple mail servers with the same preference level for load balancing, or specify servers with different preference levels to provide a backup. The A records contain the IP addresses to associate with each of the listed host names in the example.com domain. The CNAME record contains alias host names. In this example, the FTP and Web services are on the same server but have two different names that map to the same IP address. Using two separate names ensures that if the FTP service moves to another system, external users never need to know about the move.

Each domain contains another important zone file: the reverse lookup file. This file maps an IP address to a host name. The zone file

```
(A) C:\>nslookup
    Default Server:  clover.sover.net
    Address:  209.198.87.40

(B) > help
    Commands: (identifiers are shown in uppercase, [] means optional)
    NAME - print info about the host/domain NAME using default server
    NAME1 NAME2 - as above, but use NAME2 as server
    help or ? - print info on common commands
    set OPTION - set an option
            all - print options, current server and host
            [no]debug   - print debugging information
            [no]d2      - print exhaustive debugging information
            [no]defname - append domain name to each query
            [no]recurse - ask for recursive answer to query
            [no]search - use domain search list
            [no]vc - always use a virtual circuit
            domain=NAME - set default domain name to NAME
            srchlist=N1[/N2/.../N6] - set domain to N1 and search list
            to N1,N2, etc.
            root=NAME - set root server to NAME
            retry=X - set number of retries to X
            timeout=X - set initial time-out interval to X seconds
            querytype=X - set query type, e.g., A,ANY,CNAME,MX,NS,PTR,SOA
            type=X - synonym for querytype
            class=X - set query class to one of IN (Internet), CHAOS,
            HESIOD or ANY
    server NAME - set default server to NAME, using current default server
    lserver NAME - set default server to NAME, using initial server
    finger [USER] - finger the optional NAME at the current default host
    root - set current default server to the root
    ls [opt] DOMAIN [> FILE] - list addresses in DOMAIN (optional: output to FILE)
            -a - list canonical names and aliases
            -d - list all records
            -t TYPE - list records of the given type (e.g. A,CNAME,MX,NS,PTR etc.)
    view FILE - sort an 'ls' output file and view it with pg
    exit - exit the program
(C) > www.win2000mag.com
    Server:  clover.sover.net
    Address:  209.198.87.40
    Continued on page 119
    Figure 1 continued
    Name:  www.win2000mag.com
    Address:  204.56.55.202

(D) > set type=MX
     > win2000mag.com
    Server:  clover.sover.net
    Address:  209.198.87.40

     win2000mag.com MX preference = 30, mail exchanger = mail2.rockymtn.net
    win2000mag.com  MX preference = 10, mail exchanger = mail.duke.com
    win2000mag.com  MX preference = 20, mail exchanger = mail.rockymtn.net

     win2000mag.com nameserver = ns1.duke.com
    win2000mag.com  nameserver = ns2.duke.com
    mail2.rockymtn.net              internet address = 166.93.8.2
    mail.duke.com       internet address = 204.56.55.3
    mail.rockymtn.net internet address = 166.93.8.2
```

continued on page 4

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DNS Resources

Microsoft and several third parties offer products that let you provide a DNS service on a Windows NT server. Some products listed below support dynamic DNS (DDNS), which lets you dynamically update the DNS entries in environments that assign host IP addresses dynamically. The following products take advantage of NT's GUI, and I've listed a URL where you can get information about each product.

BIND for NT is a freeware port of Berkeley Internet Name Domain (BIND) to NT (and several other OSs) from Software.com (http://www.software.com/products/bindnt.html).

DNS Pro is a BIND-compatible DNS from FBLI Software (http://www.fbli.com/english/dnspro.htm).

Meta DNS is another port of BIND, from Check Point Software Technologies (http://www.metainfo.com/products/metadns.cfm).

Microsoft DNS Service comes standard with NT and is a Microsoft-developed version of DNS software, not a port of BIND (http://www.microsoft.com/ntserver/nts/deployment/planguide/dnswp.asp).

NetID 4.1 DNS Server is an IP address management tool from Nortel that includes support for DNS and DDNS (http://www.nortelnetworks.com/link/netid_4.1).

NetID 1500 DNS Server provides similar functionality as a part of Nortel Networks Adaptive Networking IP Services (http://www.nortelnetworks.com/link/netid_1500).

QIP Enterprise 5.0 from Lucent Technologies is a platform that lets you manage IP services across enterprisewide networks. QIP includes a DDNS server that is a port of BIND (http://www.lucent.com/ins/products/qip/qip_c.html).

Shadow IPmanager for Windows, part of Network TeleSystems' remote management suite, manages DNS and DDNS databases (http://www.networktelesystems.com/products/remotemgmt.html).

for the fictitious 192.168.210.0 address space (assuming that this entire Class C address has one owner) might look like the file in Listing 2, page 40. The only new RRs in this listing are the PTR records, which associate an IP address with a host name.

You'll find DNS server software under a variety of names, depending on the OS you use. Windows NT simply refers to DNS, but UNIX calls the software named (i.e., name daemon) or Berkeley Internet Name Domain; BIND is the most common name. Although each DNS software package is slightly different from others, it's useful to understand RRs and file formats so that you know how the packages lay out domain name information. For information about products that let you provide a DNS service on an NT server, see the sidebar "DNS Resources."

All DNS software uses the same terminology to refer to DNS information, whether the software uses regular DNS text-file format or a proprietary-file format. Furthermore, although individual sites might not use UNIX-based DNS software, the major ISPs do, so you need to use the correct terminology when discussing DNS with your ISP.

```
ns1.duke.com      internet address = 204.56.55.1
ns2.duke.com      internet address = 204.56.55.2
(E) > set type=SOA
> win2000mag.com
Server:  clover.sover.net
Address:  209.198.87.40

win2000mag.com
        primary name server = ns1.duke.com
        responsible mail addr = dnsadmin.duke.com
        serial  = 10
        refresh = 3600 (1 hour)
        retry   = 600 (10 mins)
        expire  = 86400 (1 day)
        default TTL = 3600 (1 hour)

win2000mag.com nameserver = ns1.duke.com
win2000mag.com nameserver = ns2.duke.com
ns1.duke.com      internet address = 204.56.55.1
ns2.duke.com      internet address = 204.56.55.2
> exit

C:\>
```

Last but not least, UDP datagrams on port 53 carry DNS queries. DNS zone transfers between primary and secondary name servers use TCP on port 53. If you run the primary DNS server on your network and connect to an outside secondary DNS server, configure your firewall so that zone transfers can occur only between the designated name servers.

Tools to Examine DNS and Domain Information

The most basic tool you can use t search a domain name or IP numb database is NSI's Whois. Althoug you'll find Whois on all UNIX sy tems and some Windows system accessing the database is easiest on t Internet. You can find NSI's W interface to Whois at http://ww

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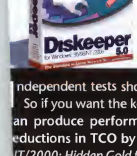

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networksolutions.com/cgibin/whois/whois. The Whois query for the win2000mag.com domain shows contact information for the domain, when the record was last updated, and the associated name servers (in preference order). You can use Whois to look up information based on domain names and contact names. Whois can also tell you whether a particular domain name is available.

Nslookup is a handy TCP/IP utility for examining the DNS database. This utility is a standard part of NT (and UNIX) systems, and versions of Nslookup for Windows 9x also exist. You can use the Nslookup utility as a test aid to examine DNS.

Figure 1 on page 44 shows an example Nslookup session. As callout A in Figure 1 shows, the user invokes the program by typing the command nslookup. The program responds by listing the name and address of the user's default name server. The first command, Help, which callout B in Figure 1 shows, lists all Nslookup commands and functions. Callout C in Figure 1 shows that the user next enters host name www.win2000-mag.com. The program responds by listing the host's IP address (204.56.55.202). The set type=MX command, which callout D in Figure 1 shows, tells the program to display MX information. The following command, Win2000mag.com, asks for information about the win2000mag.com domain. The program responds with the names and addresses of the domain's three mail servers (and two name servers). Callout E in Figure 1 shows the Set Type=SOA and Win2000mag.com commands, which tell the program to display SOA information about the win2000mag. com domain. Finally, the program responds with the SOA parameter information, as well as the names and addresses of the domain's name servers.

The NS host information that Nslookup shows (ns1.duke.com and ns2.duke.com) doesn't match the host information that the Whois lookup shows (ns1.rockymtn.net and ns2.rockymtn.net). This result is unusual but merely signals that the Whois database isn't synchronised with the name server information advertised on the Internet. Given this discrepancy, the display from nslookup is more definitive than the display from Whois.

In the past, Internet connections, IP addresses, and domain names were the responsibility of UNIX systems administrators. However, because NT represents a growing percentage of servers on the Internet, these details are important to systems administrators who have traditionally concentrated on the LAN. DNS is one of the most important aspects of your site's Internet connection. If you don't set it up correctly, your public hosts might be unreachable and your users might not be able to reach hosts on the Internet. If you want to know the nitty-gritty behind DNS, the industry-standard text is Paul Albitz and Cricket Liu's DNS and BIND, 3rd edition (O'Reilly & Associates, 1998). For NT-specific information, see Paul Albitz, Matt Larson, and Cricket Liu, DNS on Windows NT (O'Reilly & Associates, 1998). ❑

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☐ 03 Finance/Accounting
☐ 04 Insurance/Real Estate/Legal
☐ 05 Government: Federal (including Defence)
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☐ 07 Healthcare/Pharmaceutical
☐ 08 Communications Carriers (telecom, data comm, cable, Internet/ISP)
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☐ 18 Entertainment
☐ 19 Research & Development
☐ 20 Non-Profit/Trade Association
☐ 21 Consultant (non-computer)
☐ 22 Computer Manufacturer (hardware, software, peripherals, etc.)
☐ 23 IT Consultant
☐ 24 Computer-Related Retailer/ Wholesaler/Distributor
☐ 25 VAR/VAD Systems or Network Integrator
☐ 26 Other (please specify)

3 WHAT IS YOUR PRIMARY JOB FUNCTION? *check ONLY ONE*

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☐01 Chairman, CEO, MD, Owner, Partner
☐02 Controller, Accountant, CFO
☐03 General Manager
☐04 CIO, CTO, MIS
☐05 Other Corporate Management (please specify)

BUSINESS MANAGEMENT
☐06 Financial Purchasing
☐10 R&D
☐12 Engineering
☐13 Operations
☐14 Customer Service
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☐ 03 Sales/Marketing
☐ 04 Purchasing
☐ 05 Manufacturing/ Production
☐ 06 Engineering
☐ 07 Research & Development
☐ 08 IT Department
☐ 08 Other Business Function (please specify)
☐ 10 Not involved in any business functions
☐ 11 Not involved in any MIS/IT functions

5 WHICH BEST DESCRIBES YOUR PURCHASING RESPONSIBILITY? *check ALL that apply*

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☐ 2 Business Management – business manager responsible for IT decision making.
☐ 3 Centralised IT – responsibility for centralised IT decision making.
☐ 4 IT consultant – IT decision making responsibility for your clients

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☐ $2,500,000 to $9,999,999
☐ $1 Million to $2,499,999
☐ $500,000 to $999,999
☐ $400,000 to $599,999
☐ $200,000 to $399,999
☐ $100,000 to $199,999
☐ $50,000 to $99,999
☐ $25,000 to $49,999
☐ $10,000 to $24,999
☐ Under $10,000

7 WHAT IS THE HIGHEST LEVEL FOR WHICH YOU BUY, SPECIFY, RECOMMEND OR APPROVE THE PURCHASE OF COMPUTER PRODUCTS AND/OR SERVICES? *tick ONLY ONE*

☐ 1 Several different companies
☐ 2 Entire company
☐ 3 Department or division at more than one location
☐ 4 Entire location
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8 WHAT IS YOUR ORGANISATION'S STRATEGY FOCUS OVER THE NEXT 12 MONTHS?

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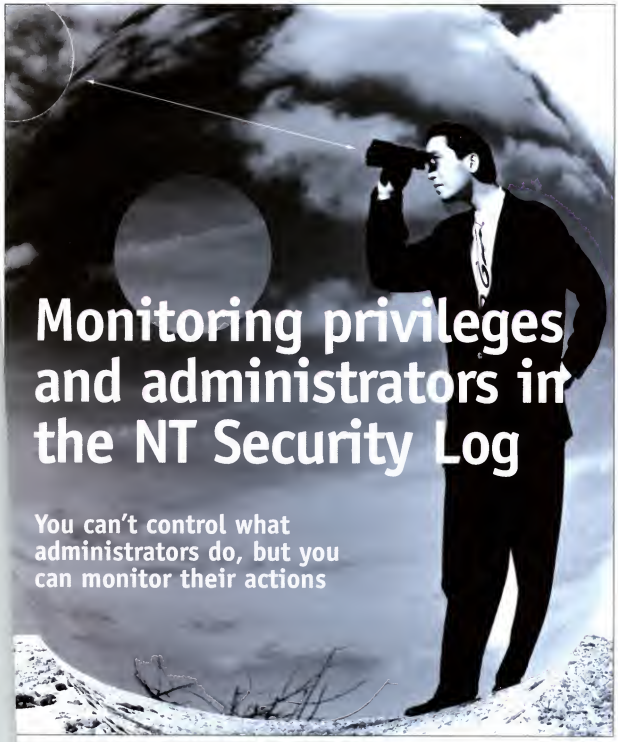

Monitoring privileges and administrators in the NT Security Log

You can't control what administrators do, but you can monitor their actions

n, "Interpreting the NT Security Log," July 2000, I showed you how to use three related audit categories – logon and logoff, file and object access, and process cking – to monitor user activity. This month, I show you privilege use and account management categories. You'll the latter especially useful for monitoring the activity of users who perform all-powerful administrator activities. Be aware that NT's terminology for audit categories is inconsistent.

The NT Event Viewer uses slightly different names for audit categories than User Manager does. Table 1, page 52, helps resolve the confusion.

Privilege Use

The privilege use category lets you track rights as users exercise them. (NT uses the terms privilege and right inconsistently.) You manage user rights assignments from the Start menu's Programs, Administrative Tools, User Manager, Policies, User Rights Policy dialog box, which Screen 1 shows.

Screen 1: Using the User Rights Policy dialog box

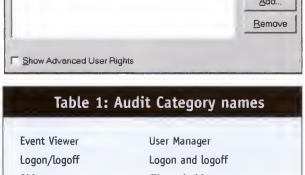

Table 1: Audit Category names

Event Viewer	User Manager
Logon/logoff	Logon and logoff
Object access	File and object access
Privilege use	Use of user rights
Account management	User and group management
Policy change	Security policy changes
System event	Restart, shutdown and system
Detailed tracking	Process tracking

When a user successfully invokes a right, such as Change the system time, NT logs event ID 577, which Figure 1, page 54, shows. The Privileges field identifies which rights the user used (SeSystemtimePrivilege, in this case). You might notice that the Privileges field's descriptions are somewhat different from the descriptions that User Manager displays in the User Rights Policy dialog box, but the two descriptions are usually easy to resolve. The Primary User Name and Client User Name fields identify the user who invoked the right.

The client information comes into play only when a user performs actions from a remote system over the network. When a user changes the local system time, only the primary user information is relevant.

However, when a user connects to an NT system and changes the system time over the network, the primary user information identifies the server application's (in this case the Server service's) user account, and the client user information reflects the user who accessed the system. The event information includes the user's Primary Logon ID, which lets you determine in which logon session the event occurred. For more details, see the discussion of the logon and logoff category in "Interpreting the NT Security Log."

Some privileges pertain only to objects. For example, one privileged object operation is SeSecurityPrivilege, which is required whenever you open the security log from the Event Viewer. Event ID 578 identifies when users invoke object privileges and specifies which privileges the user used.

Whenever a user uses a privileged action or object, event ID 577 or 578 notifies you that a user attempted to invoke a right. Both events succeed or fail depending on whether the user possessed the right he or she tried to invoke.

Users invoke some rights so frequently that if NT logged them each time, the event log would overflow with useless information. Two rights in this category that have meaning to users and administrators are SeBackupPrivilege and SeRestorePrivilege, which users invoke whenever they back up or restore an object. To audit these rights, NT simply records users' rights whenever users log on. After event ID 528 (successful logon), you'll often see event ID 576, Special Privileges Assigned to New Logon, which Figure 2 on page 54 shows. This event identifies the user's name and domain and the user's logon ID, which lets you link this event to the corresponding logon session. Event ID 576 lists the rights assigned to the user in the Assigned field. Other rights that appear under event ID 576 are SeAuditPrivilege, SeCreateTokenPrivilege, SeAssignPrimaryTokenPrivilege, and SeDebugPrivilege.

Account Management

The account management category lets you track the activities of administrators and account operators as they maintain users and groups. Unfortunately, this category usually doesn't tell you exactly which user or group properties the administrator or account operator updated but simply records which account the administrator updated, which administrator updated the account, and whether that administrator created, modified, or deleted the account. In a few cases, which I'll discuss, NT provides more specific information.

Keep in mind that NT records these events on the system where the account resides. If you create a new user account on a member server's local SAM, NT records the associated events in that server's log. If you change a domain user account, NT records the event in the PDC's log.

When you create a new user account, the security log records event ID 624, which Figure 3 on page 54 shows. This event identifies the account operator or administrator by Caller User Name and Caller Domain. In addition, the event specifies the Caller Logon ID, which lets you link the event with the corresponding logon session. NT uses the New Account Name, New Domain, and New Account ID fields to identify the new account. (Account management events use the term Account ID to refer to an account's SID.)

When you delete a user, NT logs event ID 630, which

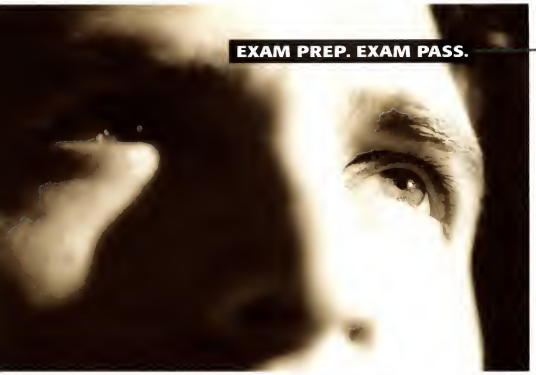

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Figure 1: Event ID 577

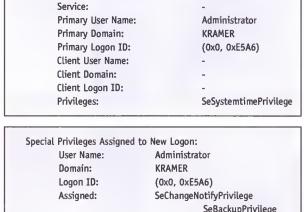


Figure 2: Event ID 576

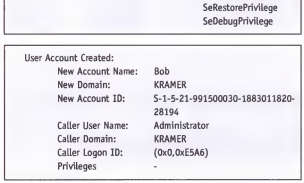


Figure 3: Event ID 624

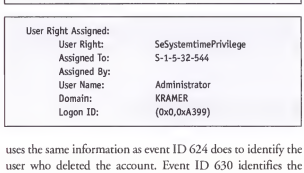
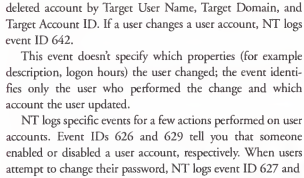


Figure 4: Event ID 608



uses the same information as event ID 624 does to identify the user who deleted the account. Event ID 630 identifies the deleted account by Target User Name, Target Domain, and Target Account ID. If a user changes a user account, NT logs event ID 642.

This event doesn't specify which properties (for example description, logon hours) the user changed; the event identifies only the user who performed the change and which account the user updated.

NT logs specific events for a few actions performed on user accounts. Event IDs 626 and 629 tell you that someone enabled or disabled a user account, respectively. When users attempt to change their password, NT logs event ID 627 and indicates success or failure depending on whether the user had authority to change the password and whether the password complied with the domain password policy. When an administrator changes a user's password, NT logs event ID 628.

The account management audit category also tracks group maintenance. NT logs all operations you can perform on groups and uses specific event IDs depending on whether the group is local or global. Creating a global group produces event ID 631, and deleting a global group logs event ID 634. If you change a global group property other than the group's list of members, NT logs event 641. The account management category of events provides more granular information about group membership changes, logging separate events when you add a global group member (event ID 632) or remove a global group member (event ID 633). Unfortunately, these events use only the SID to identify the member user or group. The account management category logs the same events for local groups: event ID 635 for group creation, event ID 638 for group deletion, event ID 639 for a group change, event ID 636 for member addition, and event ID 637 for member removal.

When an administrator uses User Manager to grant a right to a user, NT logs event ID 608, which Figure 4 shows. This event shows the right the administrator granted as well as the user to whom the administrator assigned the right. In the Assigned By section, User Name, Domain, and Logon ID identify the administrator who assigned the right. The Logon ID lets you link the event to the corresponding logon session. When an administrator revokes a user right, NT logs event ID 609, which provides the same user right information as event ID 608 does and identifies the administrator who removed the right. Don't confuse event IDs 608 and 609 with events in the privilege use category. The privilege use category's event IDs 576, 577, and 578 tell you when users (not administrators or account operators) try to use rights.

The account management category includes two other events of interest. When NT locks out a domain user account after repeated unsuccessful logon attempts, the PDC records event ID 644. Whenever an administrator changes the domain's password requirements or lockout policy, NT logs event ID 643. Although this event doesn't identify which values changed, password and lockout policies are semipermanent settings, so just knowing that they've changed is important.

NT also logs event ID 643 on servers and workstations when you change the local system policy.

The account management category is especially useful for tracking the activity of users who have administrator or account operator authority. Although you can't control what they do, at least you can monitor their actions. But what if they try to cover up their tracks by tampering with the security log?

In the next article in this series, I'll discuss the remaining audit categories and show you how to use them to detect such actions.❑

ABOUT THE AUTHOR

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Servers with grunt

by: Denise Murray

E-business is placing greater demands on servers to be reliable, scalable, available and affordable.

Server clustering, load balancing, redundant and hot-swappable power supplies and high speed bus architectures are integral parts of servers used in mission-critical applications and data centres.

Peter Hall from IRB said the trend now is for servers to be clustered together with a storage system running independently. Servers in this Buyers' Guide run from two to eight processors, with 700MHz Intel Zeon chips featuring prominently.

Load balancing is becoming more crucial to protect servers when sudden traffic increases are detected. Load balancing distributes Web traffic among multiple servers so IT managers can distribute traffic to the server cluster evenly or weigh it more heavily toward a targeted server.

Vendors are bolstering their offerings in operating systems. In June, Hewlett-Packard (HP) introduced the HP-UX11I version of its operating system which has enhanced security features and support for clustering. Sun is shipping Solaris 8 with new features, including a network cache accelerator for quicker serving of Web pages, clustering support for up to four 64-processor systems and the ability to upgrade the operating environment across multiple servers from one location. A VarBusiness survey in July found Compaq, HP and Unisys were among the top five companies that focus on Unix.

Hewlett-Packard's Netserver LXR8500 is its certified platform for the Windows 2000 Datacentre operating system – the high-end application operating platform. HP's David Booth said while the product is available now, the operating system will not start shipping for about six weeks and is only supported on 8-way and above processors.

Across all vendors, most of the 8-way boxes use similar hardware, but differ in areas such as support, service, management solution and through the channel delivery.

Booth said: "There are a range of support and warranty options available. Our standard server warranty is three years next day onsite, but that can be upgraded from anything to four hour response, 7x24 hour, and we even offer a support upgrade which is a six hour call to repair, a guaranteed fault solution within six hours. We see this as a clear differentiator, especially in the data centre environment where systems are critical to the business success."

HP has a "Select express program" where it offers the option of assembling and configuring the server to the customer's specification in the factory, thereby allowing the channel to sell "value-add services rather than screw-driver services".

Booth said: "If you ordered a high-end server with some extra memory, disc drives, another redundant power supply and a RAID controller card, you'd end up with about 15 boxes delivered which have to be unpacked and put into the server before the reseller can even start to add value to the integration.

Now however, you have the option to let HP do all that manual work in the factory, deliver it direct to the reseller or customer pre-assembled, with all the applications loaded on it and ready to turn on."

Because HP can get far more efficiency in supply chain management using the Select Express program, it can deliver that solution for approximately five percent lower cost than the standard stock delivery process. "We don't believe it cuts into the reseller margin at all. The customer can get the server for a lower price and the reseller can charge for true value-added services, as opposed to time wasting services," Booth said.

The next major technology to hit the server market later this year or early next year will be based on the Intel IA 64 architecture, with servers based on that Itanium technology. It will be the first implementation of the new 64-bit architecture which will allow systems to fully utilise a broader bandwidth in computing power.

Compaq's markering manager for industry standard servers, Terry Steer, said the PL8000 and PL8500 are Compaq's flagship 8-processor servers; the most powerful Intel-based servers that Compaq sells. The PL8000 has space for 21 hard drives. The PL8500 is built for customers who want to keep their drive external to their unit, which is useful for when they're running a cluster. External drives are also easier to manage in back up strategies and storage expansion is not limited by the box size.

"For example", Steer said, "If they want to run 100 drives and they won't fit inside a server, they use a smaller form factor server and have all the drives sitting external."

There are some model changes at Acer as the Acer Altos 21000 becomes the 22000 and the Altos 12000 is discontinued by the end of the year. Acer's Andrew Ross said all machines are certified Win2K and Red Hat Linux. Acer is focusing more on building specific models for the channel, small business systems, optimising specs for dollar and making sure availability is not a problem. Ross said the company has a "Safety Stocks" policy, where stocks are held in the warehouse so that once an order hits the system, it only takes three to four days to deliver. ❑

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Class		SupSrv	SupSrv	SupSrv	SupSrv	SupSrv
General						
	Model family name	21000	21000	8000	8000	8500
	Server type (tower, rack)	Tower	Tower	Rack	Rack	Rack
	Chipset in server	450NX	450NX	RCC 3.0 LE	RCC 3.0 LE	RCC 3.0 LE
	Description of base unit from mnf	256Mb 0GB PIII Xeon 550MHz x2	256Mb 0GB PIII Xeon 550MHz x2	1GBMb 0GB PIIIXn:550Hz x2	2GBMb 0GB PIIIXn:550Hz x4	2GB 0GB PIIIXn:550Hz x4
	List $ of base unit inc tax / GST	21994.5	15614.5	53500	103500	99500
CPU	CPU types supported	550	550	700	700	700
	Brand of CPU	XEON III	XEON III	XEON III	XEON III	XEON III
	Speed of CPU (MHz)	550	550	550	550	550
	# of CPU standard	2	2	2	4	4
	Maximum # CPU's supported	4	4	8	8	8
Memory						
	Memory standard (MB)	256	256	1000	2000	2000
	Memory maximum (MB)	4096	4096	8000	8000	8000
	Maximum overall cache (MB)	4096	2048	16000	16000	8000
	Type of cache used	BURST	BURST	BURST	BURST	BURST
Slots	# of system slots	7 6xPCI, 1x ISA	7 6xPCI, 1x ISA	11/10 10X PCI64, 1XPCI32	11/10 10X PCI64 1XPCI32	11 11X PCI64
	# of 32 bit slots	6	6	1	1	0
	# of 64 bit slots	0	0	10	10	11
	# of shared 16/32 bit slots	0	0	0	0	0
	# of EISA slots	0	0	0	0	0
	# of 16 bit slots	1	1	0	0	0
	# of other slots	0	0	0	0	0
	# of total slots available	7	5	10	10	10
Bays						
	Design of system bays	12 1X F ,1xCD,	12 1X F ,1xCD,	1xF, 1xCD, 4x,5.25,	1xF, 1xCD, 4x,5.25,	1xF, 1xCD, 4x,5.25,
	Design of system bays	4x 5.25 8x3.5HS	,4x 5.25 8x3.5HS	21x3.5HS	21x3.5HS	12x 1.6 OR 18x1
Hard disk	Largest disk supported (GB)	18.2	18.2	18	18	18
	Maximum internal storage (GB)	145.6	145.6	378	378	72
	Internal configuration (Max)	8*18.2	8x18.2	21*18	21*18	4x18gb
Storage						
	Storage options available	Cabinet	Cabinet	SSF1, F2, U1,U	SSF1, F2, U1,U	SSF1, F2, U1,U
	Rack support option	OPT	OPT	OPT	OPT	OPT
	External cabinet support option	OPT	OPT	OPT	OPT	OPT
	Fibre storage option	N/A	N/A	OPT	OPT	OPT
	Cluster server option	N/A	N/A	STD	STD	STD
Disk Controller						
	Display controller	2	2	1	1	3
	Description of display	1x UW-SCSI2, 1x EIDE	1x UW-SCSI2, 1x EIDE	Smart Array 4250E	Smart Array 4250E	1X WU SCSI-2
Raid	# Standard raid controllers	0	0	1	1	1
NIC	Integrated LAN card	STD	STD	STD	STD	STD
Power						
	Power draw (Watts)	430	430	0	0	0
	Maximum # of power supplies	3	3	3	3	3
	Hot swap power supply	STD	STD	STD	STD	STD
Warranty	Warranty (Months)	36	36	36	36	36
	Warranty on-site (Months)	36	36	36	36	36
	Type of warranty cover	NDOS	NDOS	NDOS	NDOS	NDOS
	Warranty parts cover (Mths)	36	36	36	36	36
	Warranty labour cover (Mths)	36	36	36	36	36

COMPAQ	COMPAQ	COMPAQ	HP	HP	HP	HP
8500/700-2-M1S	8500/700-4-M2S	DL580 700 1Mb Cache	L6 P3X5501M	L6 PX550 1MB	LH4 P3X500/512	LH4 PX500 1MB
SupSrv	SupSrv	SupSrv	GP Srv	GP Srv	GP Srv	GP Srv
8500 Rack RCC 3.0 LE 1GBMb 0GB PIIIXn:700Hz x2	8500 Rack RCC 3.0 LE 2GB 0GB PIIIXn:700Hz x4	DL580 Rack RCC 3.0 LE 512MB 0GB PIIIXn:700MHz x1	L6000 Rack 256Mb 1MBCAC 0GB x1 P111 XEON: 550Hz x1	L6000 Tower 256Mb 0GB P111 1MBCACXEON: 550Hz x1	LH4 Tower Intel NX Basic 256Mb 0GB P111 XEON: 500Hz x1	LH4 Tower Intel NX Basic 256Mb 1MBCAC 0GBP111 XEON: 500Hz x1
45995	92995	18995	23019.7	21917.5	15274.6	19515.1
700	700	700	700	700	500	500
XEON III	XEON III	XEON III	XEON III	XEON III	XEON III	XEON III
700	700	700	550	550	500	500
2	4	1	1	1	1	1
8	8	4	6	6	4	4
1000	2000	512	256	256	256	256
16000	16000	4096	8000	8000	4000	4000
8000	8000	8192	6144	6144	2048	4096
BURST	BURST	4Set-Assoc	BURST	BURST	BURST	BURST
11 11X PCI64	11 11X PCI64	6/5 5X 64PCI 1X ISA	8/8 8X PCI64	8/8 8X PCI64	8/8 2XPCI64,6xPCI32, 1X PCI/ISA	8/8 2XPCI64,6x PCI32,1X PCI/ISA
0	0	0	0	0	6	6
11	11	5	8	8	2	2
0	0	0	0	0	1	1
0	0	0	0	0	0	0
0	0	1	0	0	0	0
0	0	0	0	0	0	0
10	10	6	8	8	8	8
1xF, 1xCD, 4x3.5HS	1xF, 1xCD, 4x,5.25, 12x 1.6 OR 18x1	1xf,cd, 4x HDO	3x5.25 1x3.5 12x3.5HS	3x5.25 1x3.5 12x3.5HS	1xF,1xCD 2X3.5, 12x1" or 8x1.6"	1xF,1xCD 2X3.5, 12x1" or 8x1.6"
18 72 4x18gb	18 72 4x18gb	18 72 (4*18)	18 216 12*18	18 216 12*18	18 162	18 162
SSF1, F2, U1,U STD OPT OPT OPT STD	SSF1, F2, U1,U OPT OPT OPT OPT STD	SSF1, F2, U1,U OPT OPT OPT OPT STD	Rack STD OPT OPT OPT STD	Cabinet OPT OPT OPT OPT STD	Cabinet OPT OPT OPT OPT STD	Cabinet OPT OPT OPT OPT STD
3	3	1	2	2	2	2
1X WU SCSI-2	1X WU SCSI-2	1X WU SCSI3, 2chnl	1x ultra2 Dual Channel, 1X NETRAID	1x ultra2 Dual Channel, 1X NETRAID	2x ultra2 or RAID	2x ultra2 or RAID
1	1	0	1	1	1	1
STD	STD	STD	STD	STD	STD	STD
0	0	450	810	810	810	810
3	3	2	4	4	4	4
STD	STD	OPT	STD	STD	STD	STD
36	36	36	36	36	36	36
36	36	36	36	36	36	36
NDOS	NDOS	NDOS	NDOS	NDOS	NDOS	NDOS
36	36	36	0	0	0	0
36	36	36	0	0	0	0

VENDOR		HP	HP	HP	IBM	IBM
Model		LH4 PX550 2MB	LH4R P3X5501M	LH4R P3X5502M	7000 M10 PIIIX550 2M	7100 PIIIX550 512
Class		GP Srv	GP Srv	GP Srv	SupSrv	SupSrv
General						
	Modal family name	LH4	LH4	LH4	7000	7100
	Server type (tower, rack)	Tower	Rack	Rack	Rack	Rack
	Chipset in server	Intel NX Basic	Intel NX Basic	Intel NX Basic	82450NX	82450NX
	Description of base unit from mnf	256Mb 2MBCAC 0GB P111 XEON:550Hz x1	256Mb 1MBCAC 0GB P111 XEON:550Hz x1	256Mb 2MBCAC 0GB P111 XEON:550Hz x1	256MB 0GB XnP111 550MHz X1 2MB CA	256MB 0GB XnP11 550MHz X1 512K C
	List $ of base unit inc tax / GST	29889.2	21281.7	31001.3	33715	15833
CPU	CPU types supported	550	550	550	550	550
	Brand of CPU	XEON III	XEON III	XEON III	XEON III	XEON III
	Speed of CPU (MHz)	550	550	550	550	550
	# of CPU standard	1	1	1	1	1
	Maximum # CPU's supported	4	4	4	4	4
Memory						
	Memory standard (MB)	256	256	256	256	256
	Memory maximum (MB)	4000	4000	4000	8192	16384
	Maximum overall cache (MB)	16000	4096	8000	8000	2048
	Type of cache used	BURST	BURST	BURST	BURST	BURST
Slots	# of system slots	8/8 2XPCI64,6xPCI32,	8/8 2XPCI64,6xPCI32,	8/8 2XPCI64,6xPCI32,	12 5xPCI-64	6 6xPCI-64
	# of system slots	1X PCI/ISA	1X PCI/ISA	1X PCI/ISA	7xPCI-32	
	# of 32 bit slots	6	6	6	7	0
	# of 64 bit slots	2	2	2	5	6
	# of shared 16/32 bit slots	1	1	1	0	0
	# of EISA slots	0	0	0	0	0
	# of 16 bit slots	0	0	0	0	0
	# of other slots	0	0	0	0	0
	# of total slots available	8	8	8	12	6
Bays						
	Design of system bays	1xF,1xCD 2X3.5, 12x1" or 8x1.6"	3x5.25 1x3. 5 12x3.5HS	3x5.25 1x3.5 12x3.5HS	1/0x F,1/0x CD, 4 X3.5 OR (2X5.25)	14 11x3. 5 3x5.25
Hard disk	Largest disk supported (GB)	18	18	18	18	36
	Maximum internal storage (GB)	162	216	216	72.8	364
	Internal configuration (Max)		12*18	12*18	4*18	10*36
Storage						
	Storage options available	Cabinet	Rack	Rack	Rack, Cabinet	Rack, Cabinet
	Rack support option	OPT	STD	STD	STD	N/A
	External cabinet support option	OPT	OPT	OPT	OPT	OPT
	Fibra storage option	OPT	OPT	OPT	OPT	OPT
	Cluster server option	STD	STD	STD	OPT	OPT
Disk Controller						
	Display controller	2	2	2	2	2
	Description of display	2x ultra2 or RAID	1x ultra2 Dual Channel, 1X NETRAID	1x ultra2 Dual , Channel 1X NETRAID	Dual WU SCSI3	Dual WU SCSI2
Raid	# Standard raid controllers	1	1	1	0	0
NIC	Integrated LAN card	STD	STD	STD	OPT	STD
Power						
	Power draw (Watts)	810	810	810	400	250
	Maximum # of power supplies	4	4	4	3	4
	Hot swap power supply	STD	STD	STD	STD	STD
Warranty	Warranty (Months)	36	36	36	36	36
	Warranty on-site (Months)	36	36	36	36	36
	Type of warranty cover	NDOS	NDOS	NDOS	NDOS	NDOS
	Warranty parts cover (Mths)	0	0	0	36	36
	Warranty labour cover (Mths)	0	0	0	36	36

IBM	IBM	IBM	IBM	NEC	NEC	NEC
7100 PIIIX700 3RY	8500 M10 PIIIX550 1M	8500 M10 PIIIX550 2M	8500 M10 PIIIX550 5I	140HB 700 2Mb	140Ra X550 1Mb	140Ra X550 2Mb
SupSrv	SupSrv	SupSrv	SupSrv	GP Srv	GP Srv	GP Srv
7100	8500	8500	8500	140HB	140Ra	140Ra
Tower	Rack	Rack	Rack	Tower	Rack	Rack
82450NX	82450NX	82450NX	82450NX	SS3HE	RCC3.0	RCC3.0
256MB 0GB XnP111	512MB 0GB 550MHz	512MB 0GB 550MHz	256MB 0GB XnP111	256Mb 0GB PIII XEON:	256Mb 0GB PIII XEON:	256Mb 0GB PIII XEON:
700Hz X1 512K CA	550MHz X1 1MB CA	XnP111 X1 2MB CA	550MHz X1 512K CA	700Hz x1 (2MB c)	550Hz x1 (1MBC)	550Hz x1 (2MBC)
16453	40307	49756	31713	17122	24074	30181
700	550	550	550	700	550	550
XEON III	XEON III	XEON III	XEON III	XEON III	XEON III	XEON III
700	550	550	550	700	550	550
1	1	1	1	1	1	1
4	8	8	8	4	8	8
256	512	512	256	256	256	256
16384	16384	16384	16384	4000	16000	16000
4096	4000	8000	2000	8000	8000	16000
BURST	BURST	BURST	BURST	BURST	BURST	BURST
6 6xPCI-64	12 12xPCI-64 8X33mhz	12 12xPCI-64 8X33mhz	12 12xPCI-64 8X33mhz	6/ 6XPCI, 1XPCI/ISA	8/ 2XPCI-64, 6XPCI-32, 1XPCI/ISA	8/ 2XPCI-64, 6XPCI-32, 1XPCI/ISA
0	0	0	0	6	6	6
6	12	12	12	0	2	2
0	0	0	0	1	1	1
0	0	0	0	0	0	0
0	0	0	0	0	0	0
0	0	0	0	0	0	0
6	12	12	12	6	8	8
14 11x3. 5 3x5.25	5 3/2x3.5 2/2x5.25	5 3/2x3.5 2/2x5.25	5 3/2x3.5 2/2x5.25	3X5.25, 5X3.5NS oPT 5+HS	3X5.25 2x 3.5NS	3X5.25 2x 3.5NS
36	36.4	36.4	36.4	18.1	18.1	18.1
364	72.8	72.8	72.8	108.6	36.2	36.2
10*36	2*36.4	2*36.4	2*36.4	10*18.1	18*2	18*2
Rack, Cabinet	Rack, Cabinet	Rack, Cabinet	Rack, Cabinet	Cabinet	Cabinet	Cabinet
STO	STD	STO	STD	OPT	OPT	OPT
OPT	OPT	OPT	OPT	OPT	OPT	OPT
OPT	OPT	OPT	OPT	N/A	N/A	N/A
DPT	OPT	DPT	OPT	OPT	OPT	OPT
2 Dual WU SCSI2	2 Dual WU SCSI2	2 Dual WU SCSI2	2 Dual WU SCSI2	1 Ultra 2 SCSI	1 Ultra 160m SCSI	1 Ultra 160m SCSI
0	0	0	0	0	0	0
STD	STD	STD	STD	STD	STD	STD
250	750	750	750	670	612	612
4	3	3	3	1	1	1
STD	STD	STD	STD	N/A	N/A	N/A
36	36	36	36	36	36	36
36	36	36	36	36	36	36
NDOS	NDDS	NDDS	NDOS	NDDS	NDDS	NDOS
36	36	36	36	36	36	36
36	36	36	36	36	36	36

Enterprise Backup Software

Consider all the factors when choosing backup software

Data that you store on enterprise networks represents money, and for most organisations, irrecoverable loss of such data would be a financial catastrophe. Thus, choosing the correct backup software is like picking the right vehicle to take your company's receipts to the bank: You want the armoured car, not the Yugo. Unfortunately, differences between backup software applications are not as apparent as this analogy suggests. The enterprise-level backup applications I tested – Computer Associates' (CA's) ARCserveIT Advanced Edition 6.61, VERITAS Software's NetBackup 3.2 and Legato Systems' NetWorker 5.51 – can deliver network data to storage media. But differences appear in the applications' performance, ease of use, scalability, manageability, and cost.

The Test Network

In my test network, the server that hosted the backup software was a Data General AViiON 3704 with four 550MHz Pentium III Xeon processors, 2MB of Level 2 cache, and 4GB of RAM. Disk storage consisted of thirty 18GB 10,000rpm disks in an EMC CLARiiON fibre channel disk array. I configured these disks in five RAID 5 arrays of 66.1GB each. I used one array to store performance-monitor logs and other dynamic data that was not part of the data sets I backed up. For network connectivity, the server hosted two Adaptec ANA-6944B four-port 10/100 Ethernet 32-bit NICs. I used NSI Software's Balance Suite 2.71 for Windows NT to aggregate the eight ports into one IP address for transmit-and-receive load balancing. The tape library's SCSI connectivity relied on dual Adaptec AHA-2944UW Ultra HVD 32-bit adapters.

The robotic tape library was an Advanced Digital Information Corporation (ADIC) Scalar 1000 with four DLT 7000 tape drives and 158 tape slots. I divided the tape drives evenly between the two SCSI adapters in the host server. I loaded the tape library with 29 DLTs and two cleaning cartridges. Between tests, I cleaned the drives.

Service Pack 5 (SP5) ran on all NT servers in the test. The NT servers' drives used NTFS and had less than 2 percent fragmentation. Three network clients ran on Dell Precision WorkStation 410 systems; each system had dual 550MHz processors, 128MB of RAM, and on-board Adaptec 2940 U2W SCSI host adapters. Each workstation came with a 4GB SCSI disk, and I added three Seagate Cheetah 9GB 10,000rpm hard disks to each system to increase storage capacity. I configured the first system as an NT file server and configured the Cheetahs and system disk as four logical drives. I filled the system with nearly 29GB of data. I set up the second system with NetWare 5.1, configured each physical drive as a separate NetWare volume, and filled the system with 22GB of data. I used the third system for my Exchange server. I used RAID 0 to stripe the three 9GB disks and created a logical drive to hold the 16GB private Information Store (IS) and directory database. I added a 9GB disk to the third system for the 6.5GB public IS.

To create another NT file server, I added a Hewlett-Packard (HP) NetServer E45 that had a 266MHz Pentium II processor, 128MB of RAM, and an Adaptec AHA-2910C SCSI host adapter with three HP 4.2GB 7200rpm disks. I used one disk for the OS and configured the other disks as a RAID 0 stripe set to create an 8GB logical drive. I filled the logical drive almost to capacity with random data.

For the NetWare 4.11 server (Support Pack 8a), I used a Digital PC 3000 with a 300MHz Pentium II processor and 128MB of RAM. In this system, I installed an Adaptec AAA-131U2 PCI RAID controller and attached a Cheetah 9GB 10,000rpm hard disk. On this drive, I created a NetWare volume and loaded it with 7.2GB of data. The Solaris 7 server was a Sun Enterprise 250 server with dual 400MHz 64-bit UltraSPARC processors, 2GB of RAM, and six 9GB 10,000rpm hard disks configured as a RAID 5 volume. I loaded the Solaris 7 server with data totalling 31.5GB.

For the network, I used a 16-port autosensing full-duplex 10/100 switch with 1MB buffers to link the servers to eight aggregated ports on the Data General backup server. All servers communicated at 100Mbps full duplex.

ARCserveIT Advanced Edition 6.61

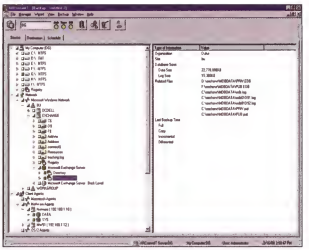
ARCserveIT, originally a NetWare and UNIX backup product, supports client agents for Windows 9x, Windows 3.1, NetWare, OS/2, Macintosh, and various UNIX platforms. The product has advanced autoloader support and support several database agents. CA aims ARCserveIT Advanced Edition 6.61 at companies that use NT as a platform for backup servers. CA designed ARCserveIT to work as a component within the company's Unicenter TNG, a large enterprise-management product, but ARCserveIT is fully functional as a standalone product. Although ARCserve

supports features such as centralised backup-database administration, ARCserveIT is a two-tier server and client product and won't scale as readily as some of the other products I tested. ARCserveIT requires NT 3.51 or later, 32MB of RAM, and 40MB to 50MB of disk storage. The product came on a CD-ROM, and a startup guide accompanied it. The CD-ROM included more documentation in Portable Document. I launched the install wizard from the CD-ROM and chose a complete installation. ARCserveIT gave me the option of installing Microsoft SQL Server rather than ARCserveIT's proprietary database, Raima. A CA technical support engineer said the Raima database holds 16 million records (although a patch enables it to contain unlimited records), and installing a SQL database lets you expand beyond 16 million records. By default, the Raima database installed on my test system. After choosing the rest of the defaults, I rebooted the server and ran the device configuration wizard. ARCserveIT identifies SCSI tape drives at the device level and automatically sets configuration parameters. The device configuration wizard recognised the Scalar 1000 and the Scalar 1000's barcode reader. Then, because I had chosen the autoconfigure option, the wizard configured the drives and robot. ARCserveIT let me designate a clean tape slot and set the cleaning interval (clean-tape configuration wasn't this easy in the other products I tested). Finally, ARCserveIT verified the media in the tape library.

ARCserveIT includes a client push agent and uses push technology to improve data-transfer performance between server and clients. After the client receives a backup request, it pushes data across the network in large-packet bursts. The ARCserveIT host server breaks up the large packets and formats them for transfer to the designated storage device. These processes, which improve performance, occur simultaneously between the client and server.

Installing the push agent was easy and quick. In the initial ARCserveIT install wizard, I chose the option to install client agents remotely. The install wizard launched its remote setup executable file (rsetup.exe) and displayed all the Windows clients on my network. I chose the clients on which I wanted to install the agent, provided a domain account and password under which the ARCserveIT agent should run, specified the target directory to install the client files, then clicked OK. The installation process completed in few minutes. After the initial setup completed, CA notified me that I needed to install SP1 to ARCserveIT. The update process was as simple as the installation was.

ARCserveIT's Exchange Server backup agent uses the Exchange Server's backup and restore API functions to back up an online database. The backup agent can also use Messaging API (MAPI) functions to perform online mailbox-level backup and restore.



◀ **Screen 1:** Viewing the Exchange Server client in an ARCServeIT directory tree

Although mailbox-level backup and restore is appealing, it doesn't provide disaster recovery or replace full Exchange database backups. The Exchange Server backup agent installed quickly and easily from the server program CD-ROM. On the server, the Exchange Server client appeared with the appropriate Exchange database options in the network client directory tree, which Screen 1 shows.

ARCserveIT's UNIX client installation was fast and uneventful. I mounted the ARCserveIT CD-ROM, then used the pkgadd command to transfer the appropriate Solaris client files to the server. I launched uagentsetup from the server's client directory and accepted the default setup options. Finally, I launched the agent with the uagent start command. On the server, the UNIX client appeared under the client tree hierarchy.

The ARCserveIT client for NetWare uses the NetWare Target Service Agent (TSA) and associated NetWare Loadable Modules (NLMs). ARCserveIT uses a module, nwagent.nlm, to interface with the TSA and process backup and restore operations. To install ARCserveIT on the NetWare servers, I launched a Windows executable file from an NT workstation running the Novell client. The basic installation was uneventful, but to improve the product's performance, CA technical support required that I change several parameters for memory, file, and directory caching and for communications. I also had to download a new TCPIP.nlm module from Novell's Web site to help performance on the NetWare servers.

Before I ran the backup test, I followed CA technical support's performance-tuning suggestions and created a separate device group for each client, which enabled ARCserveIT to use all drives in the library simultaneously. ARCserveIT completed the backup test without a problem, although its backup performance was below average.

When I ran ARCserveIT through the restore test, the

NetWare clients performed poorly. I worked with CA technical support to resolve the problem. We discovered the problem wasn't with NetWare but involved the first backup session that ARCserveIT saved to a newly formatted tape. Subsequent restore attempts from that session were extremely slow (5MB per minute). We were unable to isolate the problem's cause, but when we ran individual restore tests, the NetWare client performance was a respectable 170MB per minute. However, because the individual tests didn't include the network and device contention that other products encountered during the usual testing, I estimated ARCserveIT's restore time at 11 hours, 30 minutes.

Setting up and testing ARCserveIT was easy. I didn't need to visit a command-line interface to launch special utilities, nor did I have problems with device recognition and configuration. The administrative GUI was user-friendly and intuitive. Scheduling client and volume management was a breeze. My only complaint with the GUI is that ARCserveIT didn't always seem to leverage all the drives in the autochanger for administrative tasks such as tape formatting and erasing. Thus, I had to format and erase multiple tapes. ARCserveIT's performance was below average, but its low CPU utilisation (i.e., 9 percent during backup and 6 percent during restore), easy setup, and low cost would appeal to some organisations.

NetBackup 3.2

NetBackup supports a wide selection of server and client OSs, hardware platforms, and tape libraries. NetBackup's four-tier architecture includes a master server, a media server, client agents, and a global data manager. The master server schedules jobs, manages clients, and administers backup catalogs (i.e., databases that record backup activity). Media servers, which are flexible extensions of the master server, provide redundancy and dispersed access to backup devices. Media servers can host dedicated backup devices or share autochanger drives with other media or master servers. You can route backup jobs to multiple media servers for redundancy. To eliminate backup traffic across WAN links, you typically place media servers at remote locations. NetBackup supports 25 client platforms. For large organisations that have multiple master servers, NetBackup offers the global data manager, a centralised administration tool that lets you manage multiple backup domains (each having its own master server) from one interface. To remotely administer NetBackup's master or media servers, you can install administrative clients on other workstations in your network. NetBackup's architecture provides good scalability for enterprise environments.

The NetBackup server and client software arrived on two CD-ROMs. Eleven manuals accompanied the product. I did n't have to touch the client manuals for Macintosh or OS/2 but I had to read the other nine manuals during setup and testing. From the Data General server's console, I launched NetBackup's install wizard. I chose to install the master server component and accepted the default settings. I also installed Columbia Data Products' bundled Open Transaction Manager (OTM), which provides open-file backup support. The installation wizard recognised the Scalar 1000 from SCSI inquiry information. I used NetBackup's barcode support to inventory tapes in the autochanger.

The NetBackup install wizard recognised the DLT tape drives, though to designate the correct drive number, I had to refer to a drive and slot layout map in one manual's appendix. I found making this designation confusing – and unfor giving if you don't enter the correct parameters the first time. Detailed setup instructions in the 340-page System Administrator's Guide helped me configure the autochanger and drives. NetBackup's print documentation is well written but information is difficult to find because it's scattered across so many manuals. The online help is easier to navigate but didn't always provide the level of detail I needed. The wizard-based installation functioned reasonably well when I set up my test environment, but complex configurations involving mixed media types or multihosted autochangers require manual setup using media- and device-management utilities in NetBackup's administrative GUI.

Deploying NetBackup's client software for Windows clients was easy. By running the same install wizard that I used to set up the NetBackup server, I remotely deployed the client agents. The wizard provides a remote client installation option and lets you specify a client workstation or search the network. I searched the network and installed the NetBackup client on all the discovered workstations. To initialise the NetBackup service, I had to reboot client machines. The process was fast and trouble-free.

The Exchange client also installed easily. The client runs as an extension of the NetBackup Windows client, uses standard Exchange APIs to back up the Exchange databases, and supports incremental and differential backups that deal on with Exchange transaction logs. For NetBackup to back up the Exchange server, Exchange services must be running.

Installing the UNIX client on my Solaris 7 server also was easy. At the server console, I ran the UNIX client install program from the NetBackup CD-ROM. I then configured DNS reverse lookup zone for proper name resolution with the NetBackup master server. Remote install options for UNIX clients are available.

NetWare agent installation required considerable effo Because NetBackup uses only TCP/IP to communicate w NetWare clients, I needed to install and configure TCP/ for the NetWare 4.11 server. Then, I had to load the appropriate NLMs to enable NetWare's Storage Manageme Services. These NLMs include the NetWare data reques and TSAs and were the standard interface for the back

ARCSERVEIT ADVANCED EDITION 6.61

Contact:	**Computer Associates** * 631-342-5224 Web: http://www.cai.com
Price:	Contact vendor for pricing

agents of all the products I tested. I also loaded the NetBackup agent NLM (bpcd.nlm). However, the NetBackup agent's latest version wouldn't function on the NetWare 5.1 server. VERITAS technical support suggested that I load a NetWare 3.x version of bpcd.nlm. The only functionality the system would lose if I used the older NLM would be interface capabilities with VERITAS' Backup Exec, a data-backup product. After I loaded bpcd.nlm, my NetWare servers were ready to work with NetBackup.

The NetBackup user interfaces (UIs) took time to learn but were easy to work with; NetBackup dedicates a different GUI to each major administrative function. NetBackup's administrative GUI provides shortcuts to seven administrative utilities, including a report generator, activity and device monitors, and management interfaces for policies, media, and devices. Screen 2 shows the Backup Policy Management interface, which you use to configure policies, schedules, clients, and backup file sets. These elements reside in a NetBackup class. You can create a class to define a group of clients. Then, you can add clients, schedules, and detailed attributes for the backup jobs. The interface wasn't immediately intuitive, but after I worked with it for a couple of days, I became comfortable with the layout logic and the interface's functionality.

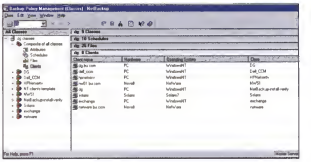
NetBackup's backup and restore performance ranks in the middle of the pack. Yet its CPU utilisation (10 percent during backup and 4 percent during restore) was among the best of all the products I tested. I worked with VERITAS' technical support staff to adjust data streams and configure multiplexing options. Parallel streaming improved the product's backup performance, but spreading a backup data set across several tapes hurt restore performance because a restore operation requires multiple tape mounts. NetBackup includes a utility you can run manually to consolidate data on one volume and thus improve restore performance.

NetBackup's strengths are its stability, scalability, additional features – which include disaster-recovery storage management – and an extensive list of supported OSs. However, the product's performance was average, and VERITAS needs to improve some interface features. I would have liked easier volume manipulation and clean-tape setup. The installation wasn't as simple as other products I tested, and although the documentation was voluminous, it wasn't well organised. NetBackup also is one of the most expensive products I tested. VERITAS' tier-level pricing matrix multiplies costs according to the number of processors in a server, so expect to pay more if you have SMP servers. You'll also pay $200 each to back up NT desktop clients; Win9x clients are a more reasonable $75 each.

NETBACKUP 3.2

Contact: VERITAS Software
1800 BACKUP
Web: http://www.veritas.com

Price: Contact vendor for pricing



◀ **Screen 2:** Viewing NetBackup's Backup Policy Management interface

NetWorker 5.51

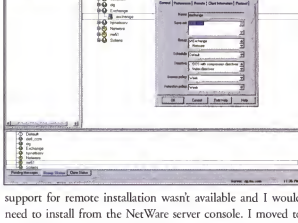
NetWorker, Legato's flagship enterprise backup application, can run on NT, several variations of UNIX, and NetWare. NetWorker also offers add-on modules for autochanger support, archiving, Hierarchical Storage Management (HSM), and centralised Java-based management. NetWorker has three elements: a server, which maintains the client file index and media database; a storage node, which is a computer that hosts additional attached storage devices; and a client, which is a computer that backs up data to a NetWorker server or storage node.

These elements constitute a data zone that is a NetWorker server's responsibility. This modular architecture is flexible and allows scalability across complex networks. According to Legato, a 5.7 release of NetWorker is imminent, but it wasn't available for my test.

NetWorker arrived on five CD-ROMs; one of the CD-ROMs contained all documentation (a paper manual is available). NetWorker Server requires SP3 with 64MB of RAM and 44MB of program-file storage. For online indexes, NetWorker requires disk space equal to 5 percent of the total backup data. Legato certifies NetWorker 5.5 to work with TCP/IP but hasn't certified the product to work with other protocols (for example IPX/SPX; those that operate with Microsoft Proxy Client).

When you buy NetWorker, Legato provides enabler codes that you enter after installation to activate the appropriate functionality level. For my test network, I was backing up a sizable chunk of data (225GB) from the local NetWorker server, so Legato gave me enabler codes to activate the NetWorker Power Edition, a NetWorker version that provides better backup performance for environments that have large databases or file systems. You can also buy Power Edition upgrades to support high-speed devices.

NetWorker's installation used a standard wizard interface. From the choices of server, client, update, and uninstall, I installed the server component. The initial installation phase went smoothly; the product asked me only to name the NetWorker server. After rebooting the machine, I launched NetWorker's administrative GUI. Another wizard appeared and guided me through more setup options, such as whether to enable client-initiated backups. I then configured the clients on my test network, gave each client a name, and gave them all membership to the default backup group that



Screen 3: ▶ Viewing administrative fields of NetWorker's Exchange client

NetWorker automatically creates.

To configure the autochanger, I launched the jbconfig.exe command-line utility. The utility recognised the autochanger through standard SCSI inquiry, and a series of prompts led me through drive configuration. The process doesn't forgive syntax errors, and it requires you to know your drives' pathnames as NT understands them. Legato provides other command-line query utilities to help you, but NetWorker's tape-library setup was more difficult than other test products' setup processes.

After I set up the library, I returned to NetWorker's administrative GUI to finish the autochanger's setup and configuration. To let me quickly label all my tapes, NetWorker used all the autochanger drives. Then, I attempted some test backups and found an annoying quirk in the setup process: Jbconfig had by default incorrectly designated one of my drives as 4mm. I didn't initially catch the incorrect designation, so I had problems with incorrect tape labels and backup jobs. I couldn't change the drive configuration through the administrative GUI or from the command line, so I deleted and reconfigured the autochanger. Then, I relabelled the tapes and continued testing. Installing the Windows clients was easy in my small test environment. On each client, I launched the setup program from the CD-ROM. I chose default settings and named the NetWorker server. NetWorker installs and starts a remote executive service that runs under the system account and allows scheduled backups. Although Legato doesn't provide automated deployment utilities, the company supports using Microsoft Systems Management Server (SMS) 1.2 to deploy NetWorker clients.

The NetWorker client for Exchange Server arrived on the BusinesSuite Module CD-ROM. The install wizard took me through a simple client setup. I also created a custom backup group for the Exchange server and specified a directive (i.e., a command that tells the backup server what to back up) to back up Exchange databases.

UNIX installation was also easy. After mounting the NetWorker CD-ROM, I ran the pkgadd command. Legato provides several scripts for installing the NetWorker server, client, and device drivers. I chose the client option, accepted the default file locations, and designated the NetWorker server on the test network. The only hitch was a loop that caused the install script to run repeatedly. After the install ran twice, I discovered the problem and exited the installation script.

When I attempted to remotely install the NetWare client from an NT box that was running the Novell client, I found a README file in the directory where the Win32 install application was supposed to be. The README file stated that support for remote installation wasn't available and I would need to install from the NetWare server console. I moved to the console, mounted the CD-ROM, and launched the installation program. After I installed the client and its five proprietary NetWorker NLMs, I couldn't communicate with the NetWorker server. After I asked Legato technical support for help, I found that the NetWare client didn't support DNS name resolution. I modified the Hosts file on each NetWare server, but I still couldn't find the NetWorker server with NetWare 4.11. Finally, I downloaded and installed the latest NetWare client (i.e., Netware 4.15) from Legato's Web site. This action resolved the communication problems so that I could perform test backups from my NetWare clients.

NetWorker's administrative GUI was relatively easy to learn, and with some assistance from online documentation I successfully set up clients and schedules. Administrative tasks in NetWorker revolve around the client. The product assigns policies, schedules, group memberships, and special backup directives at the client level. Screen 3 shows the administrative fields of the test network's Exchange client. Although group membership determines when a client's backup will run, the client schedule determines the backup level (i.e., full or differential). Legato technical support helped me tune NetWorker for optimal performance. Some of the setting changes increased to 16 from 4 the number of parallel backup data streams that the server will accept. Relative to other tested products, NetWorker's backup performance was above average, but its restore performance ranked low, with the NetWare clients finishing behind their Windows and UNIX counterparts. CPU utilisation was respectable (17 percent during backup and 12 percent during restore).

During backup testing, I had trouble with Legato NetWare clients. When I ran a scheduled backup from the NetWorker server, both NetWare clients dropped communications. Legato technical support told me to launch the backup job from the NetWorker client console on the NetWare server. After I did so, the backup completed with no problems. But requiring that you either use Rconsole to access the server remotely or visit the NetWare server defeats the purpose of centralised administration. The Windows and UNIX clients didn't have any problems. ❑

NETWORKER 5.51	
Contact:	Dawn Technologies 02 - 9417 3822 Web: http://www.legato.com
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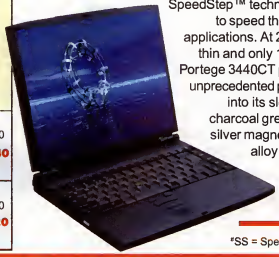

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GST Ex $855 + GST $85.50 (84096) GST INC **$940.50**

TOSHIBA Carry Bags
Toshiba Friend Carry Bag
GST Ex $80 + GST $8.00 (75901) GST INC **$88.00**
Leather Bag for A4 Notebooks
GST Ex $178 + GST $17.80 (68408) GST INC **$195.80**

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SEP 6

HARRIS TECHNOLOGY™

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HP Desktops

Pavilion 6600 Series

Pavilion 8600 Series

HP Pavilion

lue-packed! Features-packed!
tion-packed!
roducing the latest HP Pavilion
00 series, bringing you even
re features and value in an
citing new design. It combines
reliable Intel Celeron proces-
and multimedia capabilities in
leek three tone flint, slate and
nium chassis. The latest HP
vilion one-touch multimedia
board is enhanced further to
e Internet access to your
ourite websites and e-mail,
n simpler. And with free*
rnet access, a world of free
rnet is made even easier. And
preset functions from printing to playing the latest CD's, the HP Pavilion 6600 makes home computing even more fun and exciting. So if you're looking for a user-friendly, affordable great all-rounder, you can't beat the HP Pavilion 6600 series. * Terms and conditions apply.

New Look. New Features. And now even faster.

Sporting the futuristing-looking Three-Toned Flint, Slate & Titanium Gray tower casing, the highly advanced HP Pavilion 8600 series is powered by dynamic Intel Pentium III and AMD Athlon processors. Innovative new features include CD-ROM storage at the top of the chassis for up to 8 CDs, CD reading and writing capabilities (depending on the model), and conveniently located front connections to USB and serial ports. The enhanced HP Pavilion one-touch multimedia keyboard provides instant access to frequently used functions, and the Internet buttons link you directly to your favourite websites via the ISP with whom you can register directly free* of charge or as a subscriber. Easily expandable and upgradeable, these are powerfully attractive PCs at a powerfully attractive price!

* Terms and conditions apply

odel	6617	6621	8637	8632
U	Celeron® 566MHz	Celeron® 600MHz	ATH750MHz	PentuimIII 866MHz
mory	64MB	64MB	128MB	128MB
D	10.2GB	15GB	20GB	20.4GB
-ROM	48xCD	48xCD	CDR-W	8xDVD & CDRW
dem	V.90 56Kbps	V.90 56Kbps	V.90 56Kbps	V.90 56Kbps
system	Windows® 98SE	Windows® 98SE	Windows® 98SE	Windows® 98SE
nitor	15"	17"	15"	17"
t number	(A1174)	(A2402)	(A2403)	(A1181)
T Ex + GST	$1,544 + $154.40	$1,817 + $181.70	$2,726 + $272.60	$4,544 + $454.40
T INC	**$1,698.40**	**$1,998.70**	**$2,998.60**	**$4,998.40**
nitor	17"		17"	19"
t number	(A2413)		(A1179)	(A2404)
T Ex + GST	$1,726 + $172.60		$2,908 + $290.80	$4,817 + $481.70
T INC	**$1,898.60**		**$3,198.80**	**$5,298.70**

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x: 1300 13 6666
Website: www.ht.com.au
E-mail: sales@ht.com.au
Delivery Australia-Wide

HP Networks & Servers

HP ProCurve Switch 408

Unmanaged 8 port 10/100 switch in a compact sized package. This switch offers half/full duplex, 10/100 autosensing on every port.
Warranty: Lifetime, Exchange Next Day
GST Ex: $444 + GST: $44.40
(79125) GST INC:
$488.40

RentSmart
SEE PAGE 20
FOR MORE INFORMATION
*The figures quoted are based on a per week basis over 3 years. To approved persons, Terms and Conditions apply.

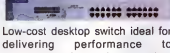
All systems include: 7 mass storage shelves (4 available after floppy, CD-ROM & 9GB disc), 5 expansion slots (4 PCI, 1 ISA combination), integrated 10/100 network interface, and easy set up CD.

SEP 8

HP PROCURVE

Check for latest prices & products

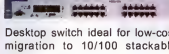
HP ProCurve 2224 Switch



Low-cost desktop switch ideal for delivering performance to workgroups with a mix of 10Mbps and 100Mbps devices and for migrating from 10Base-T to 100Base-TX:
- 24 10/100Base-TX autosensing ports
- One open transceiver slot
- Unmanaged
- Low, industry-leading price

Rent 3yrs - **$11.73***
GST Ex: $973 + GST: $97.30
(75515) GST INC:
$1,070.30

HP ProCurve Switch 2424M



Desktop switch ideal for low-cost migration to 10/100 stackable switching:
- 24 10/100Base-TX autosensing ports
- Open module slot for Gigabit stacking and uplinks
- Managed
- Low industry-leading price
- **FREE Top Tools software incl.**

Rent 3 yrs **$21.48***
GST Ex: $1,782 + GST: $178.20
(75513) GST INC:
$1,960.20

HP ProCurve 4000M Switch

A feature-rich, modular 10/100/ Gigabit desktop switch that provides low-cost switching and all the benefits of HP Proactive Networking. Ideal for medium-to-large businesses looking for scalable, expandable, low-cost migration to 10/100/Gigabit switching to the desktop.
FREE Top Tools software incl.
GST Ex: $3,779 + GST: $377.90
(66063) GST INC: **$4,156.90**
Optional Gigabit Module for
GST Ex: $1,706 + GST: $170.60
(76563) GST INC: **$1,876.60**

NEXT BUSINESS DAY ADVANCE REPLACEMENT - LIFETIME WARRANTY
******PLEASE NOTE THAT PRICES ARE SUBJECT TO CHANGE ON ALL PRODUCTS******

NETSERVER E-200

The Server with the best price/performance value for small businesses.

Starts your small business off on the right Track. The HP NetServer E200 offers the best value-to-performance ratio of any major server supplier.

A desktop PC may do the job when you are starting out, but as yo small business expands, it quickly out grows the ability to cut corners on something as fundamental as a server. And with the HP NetServer E200 HP leads the top tier server suppliers offering full server grade technology, functionality and performance for the price of a PC.
- Intel PIII600 MHz processor with 133MHz front size bus
- 64MB registered ECC RAM standard (expandable to 768)
- 9.1GB, 7200rpm, 68-pin Ultra Wide SCSI HDD
- Four PCI, one ISA
- Integrated HP NetServer 10/100TX LAN adapter

Rent 3 yrs - **$25.90***
GST Ex: $2,402+ GST: $240.20
(A1489) GST INC: **$2,642.20**
Call for long term *rental pricing

*Rental available To Approved Purchases. - Based on 3 year term for business use. Rental prices quoted are per week and include GST.

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HP Desktops

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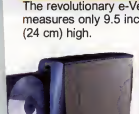
NEW!! **E-Vectra** NEW!!

Ultra-small, ultra-smart
The revolutionary e-Vectra measures only 9.5 inches (24 cm) high.

Storage
Removable, generously proportioned hard disk drive for all user needs.

Connectivity
Lockable USB, serial, parallel, PS/2 and LAN ports to fit your computing environment.



Media Choice
Fast, slim CD and media-free models.

Power
Powerful Intel Pentium III and Celeron processor configurations and generous RAM to suit any business application.

Operating Systems
Choose from a range of Microsoft operating systems including Windows 2000 to match your corporate standard.

e-Diagnostics
The intelligent eDiagTools technology allows instant problem identification and web-enabled notification to HP or your support staff.

Processor:	HP e-Vectra C566	HP e-Vectra C533	HP e-Vectra P733	HP e-Vectra P733
SDRAM	64MB	128MB	128MB	128MB
Hard Disk	8.4G	8.4G	8.4G	8.4G
FDD	optional	optional	optional	optional
Monitor	no	no	no	no
CD - ROM	24x	24x	24x	24x
OS	Windows '98	Windows '98	Windows '98	Windows 2000
GST Ex	$1,355	$2,272	$2,414	$2,591
+ GST	+ $135.50	+ $227.20	+ $241.40	+ $259.10
Part No.:	(A3532)	(98420)	(A3530)	(A3529)
GST INC:	**$1,490.50***	**$2,499.20***	**$2,655.40***	**$2,850.10***
Rental:	**$16.33**	**$24.51**	**$24.51**	**$27.95**

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SEP 9

Acer

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Home Multimedia PC's

Acer Aspire 6400

Bringing the world of multimedia into the home. The Aspire series is your ticket to not just a user-friendly, but also a "family-friendly" learning experience. Uncomplicated and designed to bring families together, the Aspire series is a strong start on the computing journey.

All Aspires come with the following fantastic software:

- Hasbro 3 game CD: Sorry!, Yahtzee, Smart Games Challenge II*
- World Book Multimedia Encyclopaedia
- Aspire time Machine System recovery
- MS Windows 98SE/I.E.5.0
- Microsoft Works 4.5
- Hasbro Interactive Battleship*
- Acer Camera Software Site**
- Acer Computer Explorer*
- PC-Cillin antivirus
- PC-Doctor
- My Aspire Guide
- Aspire Recovery CD
- KidDesk Internet Safe

* Not included with Aspire 6400
** Included only with Aspire 6400

All Aspires standard with
- 15" Monitor
- Speakers
- v.90 56k internal fax
- microtower housing

Model	Aspire 6400
CPU	PentiumIII667
Memory	64MB
HDD	15GB
CD/LAN	8x4x32 CD-RW
Video	nVidia TNT-2 16MB
Op. system	Win 98
Part number	(A3553)
GST Ex + GST	$2,272 + $227.20
GST INC	**$2,499.20**

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intel inside pentium III

Pentium III available in some Acer Systems

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Acer Power Series

Model	AcerPower Se	AcerPower Sn
CPU	C600	PIII677
Memory	64MB/10G	64MB/10G
CD-LAN	CD-LAN	CD-LAN
Op. system	Win 98	Win 98
BONUS software	**Lotus Smartsuite Quicken Business**	**MS Office SBE**
Part number	(A3554)	(A3555)
GST Ex + GST	$1,635 + $163.50	$2,090 + $209.00
GST INC	**$1798.50**	**$2,299.00**

Includes:
- Acer 15" CRT monitor
- Speakers
- Integrated UMA 8MB VGA (AcerPower Se)
- 8MB ATi RagePro TURBO 3D graphics accele (AcerPower Sn)
- 16-bit sound
- Microtower
- PC-Cillin anti-virus

At the heart of the **AcerPower Se** series is the SiS620/5595 AGPset chipset, which provides a platform for the full range of Intel® Celeron processors. The microtower housing design provides total structural integrity, durability and operational peace of mind integrated within an attractive and highly useable housing.

AcerPower Sn: The 16-bit audio on a PCI interface which further enhances multimedia-computing environments and adds rich sound to your multimedia projects. The AcerPower Sn has the winning combination for small businesses.

SEP 10

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Acer

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Acer TravelMate Notebook Series

NEW SERIES

The Perfect combination of connectivity, portability and design elements.

Model	520iT	521TXV
Screen	12.1" TFT	14" TFT
CPU	C550	PIII600SpeedStep
Memory	64MB	64MB
HDD	4.8GB	6GB
Graphics	8MB	8MB
CD-ROM	24xCD	NO
DVD	NO	*6xDVD*
Fax/Modem	56Kbps	56Kbps
LAN Card	10/100 LAN	10/100 LAN
Op. system	Win 98 SE	Win 98 SE
Part number	(A2424)	(A2425)
RENT*	$31.37	$44.17
GST Ex + GST	$2,908 + $290.80	$4,297 + $429.70
GST INC	**$3,198.80**	**$4,726.70**

Acer 600 Series

Acer 340 Series

Model	345T (CD)	345T (DVD)	508DX	602TER
Screen	12.1" TFT	12.1" TFT	12.1" HPA	13.3" TFT
CPU	PIII600SpeedStep	PIII600SpeedStep	C500	PIII650SpeedStep
RAM	64MB	64MB	32MB	64MB
HDD	6GB	6GB	4.8GB	12GB
Graphics	2.5MB	2.5MB	2MB	8MB
CD-ROM	24 x CD	NO	24 x CD	20x4x4 CD-RW
DVD	NO	6 x DVD	NO	NO
Fax/Modem	56Kbps	56Kbps	56Kbps	56Kbps
Other	10/100 Lan	10/100 Lan	NO	10/100 Lan
OS	Win 98 SE	Win 98 SE	Win 98 SE	Win 98 SE
Part	(94817)	(94818)	(A3290)	(A2426)
RENT*	$41.58	$43.91	$23.50	$53.69
GST EX + GST	$4,045+ $404.50	$4,272+ $427.20	$2,179 + $217.90	$5,355 + $535.50
GST Inc	**$4,449.50**	**$4,699.20**	**$2,396.90**	**$5,890.80**

Acer

Our 2-hour warranty service is our commitment to you.

Everyone at Acer is committed to being there for you like no one else will. That's why six out of ten of Australia's biggest IT users, use Acer PCs. And why Acer was rated No.1 in customer service and support by the Australian Personal Computer magazine survey. Our quality TravelMate notebooks now carry our guarantee of a 2-hour warranty service in Sydney, Melbourne, Brisbane, Canberra, Perth and Adelaide*. This means we'll fix your TravelMate notebook within two hours of you dropping it off at one of our service centres. Acer is the only computer company that can make that assurance to all its customers. Call 1300 366 567 or visit www.acer.com.au.

*Metropolitan areas only. Acer Australia

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SEP 11

IBM

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Notebooks, Desktops & Servers

ThinkPads

ThinkPad A20M

- Celeron 500MHz
- 64MB RAM standard
- HDD 6GB
- 24 x CD-ROM
- 12.1" TFT screen
- Windows 98

Rent 3 years - **$34.11****

GST Ex $3,162 + GST $316.20 (A0693) GST INC

$3,478.20

Call for long term rental pricing

ThinkPad T20

- Pentium III 700SSMHz
- 128MB RAM standard
- HDD 12GB
- 6 x DVD
- 14.1" TFT screen
- Windows 2000

Rent 3 years - **$68.53****

GST Ex $7,181 + GST $718.10 (A0702) GST IN

$7,899.10

Call for long term rental pricing

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Announcing: NetVista - A new era in Desktops & Thin Clients

Experience the flexible, easy-to-use, ultracompact design of the IBM NetVista legacy-free system. You can count on fast easy connections, reduced need for support and lower costs with todays current technologies, including USB.

NetVista S40 LEGACY-FREE

Processor	PIII667MHz	PIII733MHz
RAM	128MB	128MB
HDD	10GB	20GB
CD-ROM	40X CDROM	40X CDROM
LAN	10/100 NIC	10/100 NIC
Op System	Windows 2000	Windows 2000
Rent TAP*	**$21.90****	**$22.74****
Part No	(A1299)	(A1300)
GST Ex	$1,817	$2,108
+GST	$181.70	$210.80
=GST INC	**$2,998.70***	**$2318.80***

* Monitor not included

** Inc GST per week over 3 years

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Netfinity 3500 Server

Netfinity 3500

- Pentium III 733MHz
- 128MB RAM standard
- 9.1Gb HDD, Maximum storage capacity 145.6GB
- 256KB Level 2 Cache
- CD-ROM 48x max, 17x min
- Network Interface: Ethernet- Integrated

Rent 3 yrs - **$45.20****

GST Ex $4,397 + GST $439.70

(A3354) GST INC **$4,836.70**

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SEP 12

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COMPAQ

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Web Direct www.ht.com.au/cat/compaq

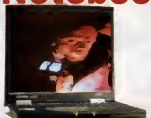
Paq- Computing for the Internet Age!

NO MONITOR	iPaq Legacy
Processor	Pentium III 500
RAM	128Mb
Hard Disk	8.4Gb
Op System	Win 95/98
Part #	(A2060)**
Rent 3 Yrs*	$16.38
GST Ex + GST:	$1,359 + $135.90
GST Inc	$1,494.90
Op System	Win NT 4.0
Part #	(A2341)**
Rent 3 Yrs*	$17.96
GST Ex + GST:	$1,490 + $149.00
GST Inc	$1,639.00
Op System	Win 2000
Part #	(A2342)**
Rent 3 Yrs*	$17.96
GST Ex + GST:	$1,490 + $149.70
GST Inc	$1,639.00

This uniquely designed product is ideal for networked environments & for mainstream office productivity applications & corporate Internet/ Intranet access.

iPAQ desktop

Presario 1700 Notebook Series



The Presario 1700 with FutureBay has been designed with the aim to offer users the ability to customise their notebook to meet their individual needs.

*SPEED STEP	1700XL	1700XL
Processor	PIII 650MHz SS*	PIII 600MHz SS*
RAM	64MB	64MB
Hard Disk	12.0 GB	6.0GB
Screen	14.1" TFT	13.3" HPA
CD-ROM	no	24xCD
DVD	6x DVD	no
Modem	56K	56K
Op System	Win 98SE	Win 98SE
Part Nº	(A3414)	(A3412)
Rent 3 Yrs*	$46.75	$41.34
GST Ex + GST:	$4,663 + $466.30	$4,022 + $402.20
Inc Tax	$5,129.30	$4,424.20

Multibay CD-Option for iPaq
GST Ex
$173 + GST
$17.30
GST Inc
$190.30
(A2348)

Compaq Monitors

15" S510 Monitor
GST Ex
$340 + GST
$34.00
GST Inc
$374.00
(A0067)

17" S710 Monitor
GST Ex
$509 + GST
$50.90
GST Inc
$559.90
(97852)

19" S910 Monitor
GST Ex
$845 + GST
$84.50
GST Inc
$929.50
(93804)

resario 5000 esktop Series

The Presario 5000 Series delivers solid features without compromising quality or performance.

MONITOR	5110	5140	5180
essor	PIII 566MHz	PIII 650MHz	PIII 750MHz
	64MB	128MB	64MB
Disk	10.0GB	15.0GB	20.0GB
:OM	40x	40x CD-ROM2	CDR-W
	no	no	no
m	56K	56K	56K
ystem	Win 98SE	Win 98SE	Win 98SE
°	(A3405)**	(A3406)**	(A3407)**
3 Yrs*	$18.62	$21.95	$27.15
+GST:	$1,545+$154.50	$2,035+$203.50	$2,517+$251.70
x	$1,699.50	$2,238.50	$2,768.70

Presario 7000 Desktop Series

The Presario 7000 Series offers the customer "Smart Solutions. Powerful Performance!"

**NO MONITOR	7000	7000
Processor	PIII 800MHz	PIII 933MHz
RAM	128MB	128MB
Hard Disk	30.0GB	30.0GB
CD-ROM	CDR-W	CDR-W2
DVD	8x DVD	8x DVD
Modem	56K	56K
Op System	Win 98SE	Win 98SE
Part Nº	(A3333)**	(A3408)**
Rent 3 Yrs*	$37.26	$43.46
GST Ex + GST:	$3,454 + $345.40	$4,228 + $422.80
Inc Tax	$3,799.40	$4,650.80

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SEP 13

SONY

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Introducing the *NEW* VAIO!

Sony VAIO SR9G

•Mobile Intel Pentium III Processor 600MHz featuring Intel SpeedStep Technology •64MB SDRAM memory •12GB hard drive •10.4" Poly-silicon XGA colour TFT display •Memory Stick Direct Slot

GST Ex $4,363 + GST $436.30

(A2499) GST INC **$4,799.30**

Sony VAIO F660

•Mobile Intel Pentium III Processor 550MHz featuring Intel SpeedStep Technology •64MB SDRAM memory •12GB hard drive •15" XGA TFT colour display •Built-in CD-ROM drive and removable FDD •Triple Programmable Power Keys

GST Ex $4,363 + GST $436.30

(A2497) GST INC **$4,799.30**

Sony VAIO Z505FA

•Mobile Intel Pentium III Processor 650MHz featuring Intel SpeedStep Technology •128MB SDRAM memory •12GB hard drive •12.1" XGA colour TFT colour display •Memory Stick Direct Slot •Direct Ethernet port

GST Ex $5,090 + GST $509.00

(A2498) GST INC **$5,599.00**

Sony VAIO XE7

•Mobile Intel Pentium III Processor 650MHz featuring Intel SpeedStep Technology •128MB SDRAM memory •18.1GB hard drive •14.1" XGA colour TFT display •Removable CD-RW drive •Mini docking station

GST Ex $6,181 + GST $618.10

(A2496) GST INC **$6,799.10**

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VAIO World Products

New VAIO World Products that all take the New Memory Stick! *Call for pricing and availability.*

GST Ex $Call + GST $Call (xxxxx) GST INC **$Call**

SEP 14

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SONY

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Eye catching CyberShot Cameras

Cyber-shot

Sony CyberShot DSC-S30

Memory Stick Digital Camera 1.3 Megapixel resolution (1.6 megapixel interpolated) 6x Precision Digital zoom (3x Optical zoom) 2" Colour LCD monitor, Interface Scan Super HAD CCD InfoLITHIUM M series battery 12bit A/D conversion Super Resolution Converter Automatic Focus Automatic/Priority Aperture Automatic/Priority Shutter Auto/Manual/Preset White Balance Exposure control

GST Ex $973 + GST $97.30
(99849) GST INC
$1,070.30

Sony CyberShot DSC-S70

Memory Stick Digital Camera 3.3 Megapixel resolution, 6x Precision Digital zoom (3x Optical zoom), 2" Colour LCD monitor, Super HAD CCD InfoLITHIUM M series battery, MPEG Movie function, Auto Focus, Auto/Priority Aperture, Auto/Priority Shutter, Sharpness control Spot Metering Automatic Photo Orientation (Portrait/Landscape) Built-in flash, red-eye reduction, External Flash socket, On-Screen Display, video/audio out, USB In/Out, Self Timer function Date/Time Stamp function Windows and Mac compatible

GST Ex $1,654 + GST $165.40
(99850) GST INC
$1,819.40

MSAC-US1 Memory Stick USB Adapter

- USB Interface Windows 98 compatible
- Macintosh compatible (MacOS 8.5.1 or newer) • Operating Voltage: 4.75 - 5.25V (bus powered)• Dimensions (WxHxD): 68x89x25mm • Weight: 70g

GST Ex $141 + GST $14.10
(97398) GST INC **$155.10**

Assorted Memory Sticks

8MB Memory Stick
GST Ex $38 + GST $3.80 (88647) GST INC **$41.80**

16MB Memory Stick
GST Ex $95 + GST $9.50 (86779) GST INC **$104.50**

32MB Memory Stick
GST Ex $145 + GST $14.50 (88654) GST INC **$159.50**

64MB Memory Stick
GST Ex $252 + GST $25.20 (88648) GST INC **$277.20**

Sony Memory Stick

Smaller than a stick of chewing gum, Memory Stick is the next generation of digital storage media. Imagine carrying around an entire encyclopedia, your complete medical records, a whole library of electronic books and generations of family albums in your pocket. Now imagine Memory Stick - a miniature recording media that fits every digital product you own, including your mobile phone, car, PC, Laptop, camera, Handycam, personal audio player, hi-fi, TV , photo frame and robot. And this is only a taste of what's to come. Memory stick allows information, images, sound and other digital data to move from one digital device to another. Sony has released the 8MB, 16MB, 32MB & 64MB with 128MB & 1GB developed. Transferring Memory Stick data is easy through Sony's easy-to-use Memory Stick Floppy Disk Adaptor, PC-Card Adaptor or a fast USB Adaptor. Sony's vision of a Memory Stick universe is already a reality.

Win the ultimate Laptop

Sony Data Media is giving you the chance to win the ultimate laptop

The amazing VAIO from Sony! VAIO WORLD is a world of possibility where digital products interact seamlessly. Bringing together audio and video, computing and communications. To win the ultimate laptop simply purchase specially marked boxes of CDR and Floppy disk or Sony DDS cartridges during August and November and you can be in the running to win one of 5 VAIO Laptops.

Sony CDR

Sony 74Min 650Mb CD-R Blank Media 10 Pack (26680)
GST Ex $18 + GST $1.80 GST INC
$19.80

SEP 15

SHARP
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More from SHARP

FO-880 Plain Paper Fax
Digital Answer Machine, compact Thermal Transfer
GST Ex $386 + GST $38.60
(86520)
GST INC
$424.60

FO-1460 Plain Paper Fax
Thermal Transfer
GST Ex $433 + GST $43.30
(74318)
GST INC
$476.30

LL-T155A

- Screen size 15-inch (diagonal 38cm), resolution XGA (max 1024 x 768 dots)
- High- Resolution (200 cd/m², 300:1) TFT LCD for superb image quality, up to 16 million colours
- Auto balance (automatic colour level adjustment)
- Automatic pixel converter (VGA/SVGA)
- Long-lasting backlights- up to 50,000 hours
- Power management function- max 22W during operation, down to 5W during power safe mode
- Plug and play compatible- Win 95/98
- USB for easy connection to various peripheral devices
- Uses one-fourth the space of a CRT monitor
- User- friendly design with reduced flicker is easier on the eyes.

GST Ex $1,936 + GST $193.60 (A2819) GST INC

$2,129.60

PCA820

- Intel Pentium III 500MHz Processor
- 8.1Gb Hard Disk Drive
- 64Mb RAM (Expandable to 192Mb)
- 24x CD-Rom drive
- 13.3" Low-reflection XGA TFT LCD Screen
- Display resolution 1024 x 768 up to 16 Million Colours
- 16-Bit stereo soundcard & one speaker
- Includes 56K fax modem built-in
- NeoMagic NM2380 (including 6.0MBVideo RAM)
- Type II slot x 1, cardbus support
- Li-ion Battery pack (1.8 hours)

GST Ex $4,817 + GST $481.70 (A1533) GST INC

$5,298.70

FO2950M

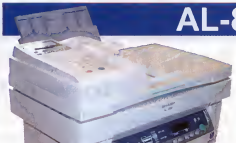
Advanced performance with convenient email functions

- Fast 14.4 Kbps modem, 6 sec/page transmission speed
- 8 ppm quick scan
- 8 ppm print speed
- Capacity: 200 sheets and a 20 sheet auto document feeder.
- 100 speed dial locations and 20 one touch rapid dial keys.
- Laser printing 8 ppm and at 1,800 (enhanced) x 600 dpi resolution. Included printer drivers support Windows 95/ 98 / NT4.0
- 600 dpi (enhanced) B&W scanning in 256 gradations.
- Fax PC-generated documents directly from your computer.
- Send documents to any e-mail address. Scan document then send as a file attachment.
- Automatically forward incoming faxes to a designated e-mail address.

GST Ex $1,173 + GST $117.30 (A2549) GST INC

$1,290.30

AL-880



GST Ex $1,62
+ GST $162.6
(92726) GST IN

$1,788.6

- High Quality 600dpi Digital Laser Multifunction (copy, print, fax, scan)
- 8cpm
- Built in Printer function: The digital copier is also an 8p true 600dpi x 600dpi laser printer with IEE1284 bi-directional interface port
- Built in G3 fax with SPF function
- Easy operation from Fax Operation Panel
- Built in Scanner function, twain compliant
- Scan Once Print Many (SOPM) function
- Space saving Stationery Platen
- 250 sheet Rear Loading Paper Tray
- Zoom function with Reduction/Enlargement from 50% 200%
- Front loading supply cartridges make replacement e

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SEP 16

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COMPUCON

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Enjoy a world of difference

Established around the world since 1990, Compucon brand has become a trusted name in the PC industry

An international brand with locations throughout the Asia-Pacific region and North America

Quality-accredited under ISO9002 standard of excellence, Winner of many Editor's Choice & Best Product' awards.

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Compucon AMD

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00MHz

- 2GB Ultra DMA 66Hard Disk Drive
- MB PC100 SDRAM
- MB AGP Graphics Card (ATI Rage IIc)
- x AGP, 4 x PCI and 3 x ISA Slots
- Serial, 1 Parallel & 2 USB Ports
- 3/2 Wheel Mouse
- indows 95 or 98
- 3/2 104-key Keyboard
- di-Tower Case
- 1.44 Floppy Disk Drive
- 3 Years On-Site Warranty

Rent 3 Yrs** **$12.81**
GST Ex $1,063 + GST $106.30
(A2358) GST Inc

$1,169.30*

* Monitor Not included

This system with 15" Compucon Multimedia Monitor:
Rent 3 Yrs** **$16.39** GST Ex $1,360 + GST
$136.00 GST Inc **$1,496.00**
Monitor price is
GST Ex $284 + GST $28.40
(25874) GST Inc **$312.40**

Intel Celeron

COMPUCON

66MHz **Intel Celeron Processor**

- /2 Wheel Mouse
- ndows 95 or 98
- 2GB Hard Disk Drive
- MB SDRAM
- B AGP Graphics Card (ATI RanRge)
- AGP, 3x PCI and 1x ISA Slots
- erial, 1 Parallel & 2 USB Ports
- 2 104-key Keyboard
- MB Combo Network Card
- Midi-Tower Case
- 1.44 Floppy Disk Drive
- 3 Years On-Site Warranty

Rent 3 Yrs** **$14.02**
GST Ex $1,162 + GST $116.20
(A2359) GST Inc

$1,278.20*

* Monitor Not included

This system with 15" Compucon Multimedia Monitor:
Rent 3 Yrs** **$17.44** GST Ex $1,447+ GST
$144.70 GST Inc **$1,590.70**
Monitor price is
GST Ex $284 + GST $28.40
(25874) GST Inc **$312.40**

Intel Pentium III

COMPUCON

MHz **Intel Pentium III Processor**

- GB Hard Disk Drive
- B SDRAM
- AGP Graphics Card (ATI Range)
- GP, 4x PCI and 3x ISA Slots
- rial, 1 Parallel & 2 USB Ports
- Wheel Mouse
- dows 95
- 104-key Keyboard
- B Combo Network Card
- Midi-Tower Case
- 1.44 Floppy Disk Drive
- 3 Years On-Site Warranty

Rent 3 Yrs** **$17.26**
GST Ex $1,432+ GST $143.20
(A2361) GST Inc

$1,575.20*

* Monitor Not included

This system with 17" Compucon Multimedia Monitor:
Rent 3 Yrs** **$22.11** GST Ex $1,836 + GST
$183.60 GST Inc **$2,019.60**
Monitor price is
GST Ex $402 + GST $40.20
(25906) GST Inc **$442.20**

Rent Smart

SEE PAGE 20

FOR MORE INFORMATION The figures quoted are based on a per week basis over 3 years. To approved persons, Terms and Conditions apply.

SEP 17

Xircom

Lucent Technologies Bell Labs Innovations

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Mobile Access Solutions

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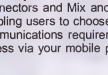
Xircom RealPort 2

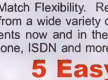
The only access cards with integrated connectors! No more hassles with fragile cables and pop-out jacks.

The Only Personalized Notebook Communications Solutions: The RealPort2 Integrated PC Card with Built Connectors and Mix and Match Flexibility. RealPort2 Integrated PC Cards with built-in connectors add flexibility enabling users to choose from a wide variety of access cards that can be used alone or mixed and matched to m communications requirements now and in the future. Combine a 56K modem, 10/100 Ethernet LAN, wireless d access via your mobile phone, ISDN and more!

5 Easy steps as follows

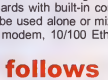


1 Choose Desired Realport2 Cards

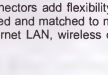


2 Flip one RealPort2 card over and place on top of the other

3 Align tabs and join cards



4 Insert joined cards into PC Card slot of Notebook



5 Plug in cables

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Realport2 Global Access Modem
GST Ex: $319 + GST: $31.90
(92739) GST Inc: **$350.90**

Realport2 10/100 Ethernet Card 16 bit
GST Ex: $255 + GST: $25.50
(92746) GST Inc: **$280.50**

Realport2 CardBus 10/ 100 Ethernet 32 bit
GST Ex: $260 + GST: $26.0
(92756) GST Inc: **$286.0**

Xircom NetStation

The All in One Conference Room Networking Solution

- Mounting holes and lock compatibility provide security options
- Auto negotiation of 10 or 100 Mbps (NWay) network speeds
- Half or full duplex at both speeds for increased network performance
- Two Diagnostic LEDS per port provide connection status at a glance
- Dedicated bandwidth to each user

NetStation set up is a SNAP!

1 Plug combined power/ Ethernet cable into unit

2 Place NetStation on

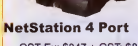
3 Pull retractabl Ethernet cable a plug into network

HARRIS TECHNOLOGY @ Kmart

Broadway (Sydney) Burwood (Melbourne)

Kmart Shoppers! Not all products are in-store, but consulting & advice available on all items

NetStation 4 Port
GST Ex: $847 + GST: $84.70
(A0945) GST Inc: **$931.70**



NetStation 8 Port
GST Ex: $1,345 + GST: $134.50
(A0947) GST Inc: **$1,479.50**

Xircom Rex 5000 Companion

Worlds smallest Connected Organizer. BIG in functionality.

Powerful - Access up to 6000 Entries
Portable - Credit Card Sized, and weighs only 1 ounces, so you can take your important data with yo
Easy to Use - Includes everything you need to g organized, synchronise with software on your compute
- Display: 9-line, high-contrast 160 x 98 black-and-wh LCD
- Memory 512K
- Size: 3-3/8" x 2-1/8" x 1/4"
- PCMCIA: Type II PC Card

GST Ex: $163 + GST: $16
(86631) GST Inc: **$179.**

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HARRIS TECHNOLOGY

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Quantum

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If it's important to you, save it with us

Plug it in, turn it on. Now adding a file server is a Snap!

he Quantum Snap Server is the ideal solution for grading your network storage. It offers the perfect mbination of quick and easy installation at prices r below what you would pay for a traditional NT rver. It's pre-configured to work in all major network vironments, which means you really just plug it in d turn it on - with no network downtime. In fact, Snap Server is so hassle-free, it installs in less n 5 minutes!

Snap! server

Performance Pentium-class processor with
- Quantum Ultra ATA hard disk drives
- RAID 0, 1 or 5
- Unlimited license, easily supports 100 clients

Compatibility Simultaneous support for Windows 95/98 2000, NT, NetWare, UNIX and Macintosh networks and clients across TCP/IP, IPX, NetBEUI and AppleTalk

Network Security Integrates with NT Domain Controller and NetWare Bindery servers or local user list

Warranty 3-year parts and labour

The Award-Winning Snap Server Family

15GB 1 drive, desktop, portable
GST Ex:$1049 + GST: $104.90 (A3489) GST inc: **$1,153.90**

30GB 1 drive, desktop, portable
GST Ex: $1581 + GST: $158.10 (A3528) GST inc: **$1,739.10**

40GB 2 drives, RAID 0, 1, desktop
GST Ex: $2635 + GST: $263.50 (A0048) GST inc: **$2,898.50**

60GB 2 drives, RAID 0, 1, desktop
GST Ex: $3216 + GST: $321.60 (A3526) GST inc: **$3,537.60**

120GB 4 drives, RAID 0, 1, 5, rack-mount
GST Ex: $5816 + GST: $581.60 (A3527) GST inc: **$6,397.60**

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SEP 19

RentSmart
It's smarter business to rent.

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FAST ONLINE APPROVAL!

THE *FASTEST* WAY TO GET THE EQUIPMENT YOU NEED AND SAVE MONEY!

RentSmart and Harris Technology are proud to introduce Australia's first online computer finance facility, available to your business at the Harris website today!

Now you can shop online with Harris and be approved for up to $15,000 in RentSmart finance in just minutes.

You can afford more with RentSmart through cashflow friendly monthly payment that are fully tax deductible for business purposes.*

What's more, renting means you can upgrade to new technology when you need.

Here's how it works:

1. Simply shop for the equipment you need on the Harris site now.
2. Select RentSmart as your chosen payment method.
3. Complete the quick, secure online application form.
4. If you are approved with RentSmart, your RentSmart account will be automatically set up in just minutes.

RentSmart will then send you your application to sign, and your equipment will be ordered.

Remember, renting is the cost-effective solution for businesses to get the technology they need to succeed.

RentSmart
It's smarter business to rent.

Check out how little RentSmart costs:

Purchase Price (GST Inclusive)	36 Months (per week)	24 Month (per wee
$1000	$10.96	$13.73
$2000	$21.92	$27.46
$3000	$29.42	$39.12
$5000	$45.58	$62.08

For more information, phone now on Freecall:

Harris Technology 1300 13 99 99

RentSm 1800 688 7

Prices intended as a guide only. RentSmart is available to qual customers on selected products with a total retail value above $

*Consult your accountant for further advice.

DON'T FORGET your Fly Buys points

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Kmart Shoppers! Not all products are in-store, but consulting & advice available on all items

Wine on-line?
VINTAGE CELLARS
vintagecellars.com.au

SEP 20

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APC®
AMERICAN POWER CONVERSION

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Power Back Up = Power Protection

APC BACK UPS PRO® FOR WORKSTATIONS

Smart battery backup and high performance surge suppression for Windows 95 & NT PCs

- PowerChute® Plus software lets your UPS shut down your applications gracefully in the event of an extended power failure
- Audible alarms
- Additional outlet for protection of printers
- Phone/modem protection
- User replaceable, hot swappable batteries

APC Back-UPS Pro 280si
GST Ex $242 + GST $24.20
(76636) GST INC **$266.20**

APC Back-UPS Pro 420si
GST Ex $323+ GST $32.30
(76637) GST INC **$355.30**

APC Back-UPS Pro 650si
GST Ex $405 + GST $40.50
(76638) GST INC **$445.50**

APC Surge Arrest

SurgeArrest is equipped with a fast acting fuse that reacts quickly to lightning strikes and other catastrophic surge events. In addition, a thermal fuse shuts your system down in the event of a dangerous wiring fault. In both cases, SurgeArrest actually blocks errant power from reaching your equipment if the surge components are damaged

SurgeArrest 5 Strip
GST Ex $49
+ GST $4.90
(99591) GST INC
$53.90

PNote Pro®

The SurgeArrest Notebook Pro Surge Protector provides the mobile notebook professional with advanced AC and telephone line protection. The unique, in-line design creates a compact, lightweight surge protector that is truly portable and appropriate for use in any country throughout the world. With built-in Excess Current Detection, the Notebook Pro warns you against potential modem damage. A Velcro mounting strap and 6 ft. telephone cord eliminate the need to carry any additional accessories.

PNote Pro
GST Ex $56
+ GST $5.60
(99592) GST INC
$61.60

APC Smart-UPS 2U Rack Mounts® FOR SMALL OFFICE SERVERS

New! Smart-UPS 700, 1000, and 1400 2U Rack Mounts

Utilizing Surface Mount Technology, more Application-Specific Integrated Circuits, and fewer components, we have created a more reliable UPS. New 2U(3.5in/8.89cm) design saves valuable rack U space. These models require 30% less rack height and will still fit into a 600mm four-post rack!

APC Smart-UPS 2u700
GST Ex $789 + GST $78.90
(99595) GST INC **$867.90**

APC Smart-UPS 2u1000
GST Ex $991 + GST $99.10
(99596) GST INC **$1,090.10**

APC Smart-UPS 2u1400
GST Ex $1,454 + GST $145.40
(99597) GST INC **$1,599.40**

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Back-Ups for PC's!

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GST Ex $160
+ GST $16.00
(56229)
GST INC
$176.00

500va
GST Ex $193
+ GST $19.30
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GST INC
$212.30

650va
GST Ex $240
+ GST $24.00
(56231)
GST INC
$264.00

APC Symmetra
Power Array 8kVA, exp. to 16kVA
GST Ex $12,113+
GST $1,211.30
(71087)
GST INC
$13,324.30
So good we use it ourselves!

SEP 21

NETGEAR™

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Take the Work out of Networking

10/100MBPS FAST ETHERNET SWITCHES

The NETGEAR FS105 and FS108 feature 5 or 8 switched 10/100 Mbps ports, auto-speed and duplex mode sensing. Versatile and compatible. Compact and easy to install. Vista jacks with built-in LEDs.

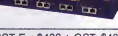
FS 105 5 Port Autosensing
GST Ex: $173 + GST: $17.30 (84722) GST Inc: **$190.30**

Collect 1,500 Bonus Fly Buys points when you purchase 84722, 70905, 77242, 60522 or 77549 between 20/8/00 & 30/9/00

FS 108 8 Port Autosensing
GST Ex: $252 + GST: $25.20 (70905) GST Inc: **$277.20**

FS 308 8 Port Autosensing
GST Ex: $436 + GST: $43 (77242) GST Inc: **$479.**

The NETGEAR FS516 & FS524 switches provide powerful, network center performance with all 16 or 24 ports capable of 10 or 100 Mbps, half- or full-duplex operation, automatic speed sensing. Ideal for segmenting networks into small, connected subnets. Vista network ports with built-in LEDs.



FS 516 16 Port Autosensing
GST Ex: $850 + GST: $85.00 (60522) GST Inc: **$935.00**

FS 524 24 Port Autosensing
GST Ex: $1008 + GST: $100 (77549) GST Inc: **$1,108**

TAKE THE WORK OUT OF NETWORKING
NETWORK STARTER KITS

Free modem sharing software

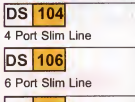
The NETGEAR Network Starter kits give Windows users everything they nee start networking right away at either 10 Mbps or 100 Mbps. The kits containing 100 PCI cards, a hub or switch, network cables, modem sharing software and easy to read how to guide. Within a few minutes, you will be able to share files printers, exchange e-mails, play interactive games and share access to the Inter

DB 104 4 Port Dual speed starter kit
GST Ex: $201 + GST: $20.10 (77292) GST Inc: **$221.10**

FB 105 5 Port switch starter kit
GST Ex: $315 + GST: $31 (73997) GST Inc: **$346**

SB 105 5 Port 10 Mbs starter kit
GST Ex: $119 + GST: $11.90 (A3293) GST Inc: **$130.90**

Netgear offers FREE 24-hour phone suppor



10/100 DUAL SPEED HUBS

These Netgear hubs connect multiple PCs to share printers, files, Internet access and e-mail communications. Mix & match 10 and 100Mbps PCs, servers and peripherals on the same netw with ease and without the high cost and complexity of multiple hubs and bridges. All feature easy, and play installation, auto-sensing dual speed ports and vista network ports with built-in LEDs.

DS 104 4 Port Slim Line
GST Ex: $145 + GST: $14.50 (70795) GST Inc: **$159.50**

DS 309
GST Ex: $337 + GST: $3 (87479) GST Inc: **$370**

DS 106 6 Port Slim Line
GST Ex: $198 + GST: $19.80 (84721) GST Inc: **$217.80**

DS 508 8 Port Stackable
GST Ex: $423 + GST: $4 (18738) GST Inc: **$465**

DS 108 8 Port Slim Line
GST Ex: $205 + GST: $20.50 (18755) GST Inc: **$225.50**

DS 516 16 Port Stackable
GST Ex: $597 + GST: $ (18747) GST Inc: **$65**

DS 116 16 Port Slim Line
GST Ex: $344 + GST: $34.40 (81519) GST Inc: **$378.40**

DS 524 24 Port Stackable
GST Ex: $699 + GST: $ (69474) GST Inc: **$76**

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NETGEAR™

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Cost-effective Connectivity Solutions

NOW SHIPPING!

GIGABIT SWITCHES

These 3 new gigabit switches from Netgear make it possible for small businesses and branch offices to fulfill requirements for higher bandwidth as their networks become increasingly congested. The switches provide customers a faster server connection and allow multiple Fast Ethernet users to access the server at 100 Mbps at the same time.

FS 510T GST Ex: $1607 + GST: $160.70 (A1209) GST Inc: **$1,767.70**
Eight switched 10/100Mbps ports + two 1000Mbps port (Catagory 5)

FS 518T GST Ex: $2606 + GST: $260.60 (A1374) GST Inc: **$2,866.60**
Sixteen switched 10/100Mbps ports + two 1000Mbps ports (Catagory 5)

GS 504T GST Ex: $2,964 + GST: $296.40 (A1375) GST Inc: **$3,260.40**
Four full-duplex Gigabit Catagory 5 ports

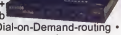
Please Note that Fibre Gigabit Switches are also available

ISDN ROUTER

Latest technology with ease-of-use designs. Compatible with all major Internet ISDN equipment, this is the ideal router for Internet access, LAN-to-LAN connection, and remote access for a single user, small business or branch office over ISDN. Includes auto sensing input 10/100 network port & caller ID on one ports.

RT 338 GST Ex: $568 + GST: $56.80 (97718) GST Inc: **$624.80**

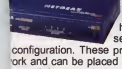
ANALOG MODEM ROUTER



Connect multiple **PCs to the Internet** router + integrated 56K modem + integrated 4-port 10BaseT hub • DHCP server • Dynamic NAT+ • Dial-on-Demand-routing • V.fn (STAC LZS) compression • 5 year warranty •

M 356 GST Ex: $494 + GST: $49.40 (70197) GST Inc: **$543.40**

PRINTER SERVERS



The NETGEAR print servers let you share any parallel printer among all users on the network without having to dedicate a PC for print serving and without complex setup configuration. These print servers connect directly to the network and can be placed anywhere convenient to the users. A built-in network 4 port hub, the PS105 is an all-in-one productivity solution for the SOHO users- providing file, print and resource sharing as well as network gaming.

105 GST Ex: $188 + GST: $18.80 (67225) GST Inc: **$206.80**
10/100bpsPrint Server

The PS110 attaches to a 10 or 100Mbps hub or switch, providing effortless transition from Ethernet to Fast Ethernet. It also supports 2 parallel printers.

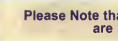
110 GST Ex: $211 + GST: $21.10 (67226) GST Inc: **$232.10**
10/100Mbps Print Server

113 GST Ex: $Call + GST: $Call (A3287) GST Inc: **$Call**
10/100Mbps print server supports up to 3 parallel printers

GIGABIT NETWORK CARD

GA 620T GST Ex: $631 + GST: $63.10 (A1382) GST Inc: **$694.10**
Gigabit Network Interface Card

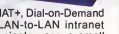
CABLE/DSL INTERNET GATEWAY



Connect multiple PCs to share single IP address. The NETGEAR RT311 provides NAT service that allows up to 32 users on your 10/100 network to share the high- speed Internet connection. At the same time it also provides firewall protection to guard your network against hackers and unauthorised access from the Internet.

RT 311 GST Ex: $339 + GST: $33.90 (97719) GST Inc: **$372.90**

ISDN ROUTER



Home office Internet access in a box. Includes built-in ISDN TA, 128 MultiLink PPP, DHCP Server, Dynamic NAT+, Dial-on-Demand Routing. Provides Internet access, LAN-to-LAN intranet connection, and remote access for a single user, a small business, or a branch office over ISDN.

RT 328 GST Ex: $525 + GST: $52.50 (68900) GST Inc: **$577.50**

10MBPS ETHERNET HUBS

Vista jacks with built-in LED indicators • Uplink port for network expansion • Slim, sturdy metal case design • BNC/AUI backbone support option • Limited lifetime warranty • Easy plug and play installation

EN 104TP GST Ex: $60 + GST: $6.00 (53456) GST Inc: **$66.00**
4 Port Slim Line

EN 108TP GST Ex: $88 + GST: $8.80 (53458) GST Inc: **$96.80**
8 Port Slim Line

EN 116 GST Ex: $196 + GST: $19.60 (53459) GST Inc: **$215.60**
16 Port Slim Line

EN 516 GST Ex: $207 + GST: $20.70 (17425) GST Inc: **$227.70**
16 Port Rackmount

EN 524 GST Ex: $271 + GST: $27.10 (17435) GST Inc: **$298.10**
24 Port Rackmount

• 16 or 24 10BASE-T ports • Easy installation • Vista network port with built-in LEDs • BNC/AUI backbone support • Internal power supply

NETGEAR

FA 310 Ethernet Adapter 10/100 PCI

(53460) GST Ex: $43 GST: $4.30 GST Inc: **$47.30**

FA 312 Wake on Lan card (A1373) GST Ex: $52 GST: $5.20 GST Inc: **$57.20**

FA 410 PCMCIA 10/100 Mbps Network Card

(60071) GST Ex: $140 GST: $14.00 GST Inc: **$154.00**

FA 510 Network Card for Notebook PC (81319) GST Ex: $145 GST: $14.50 GST Inc: **$159.50**

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D-Link®

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Small-Medium Business Networks

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DES-3624IF
24 Port Stackable Giga Switch

The DES-3624IF unit offers 24 ports of 10/100TX. Plus 1 100 base FX (SC) port build in SNMP and RMON agents. Optional giga module available.

NEW PRODUCT

GST Ex: $1,816 + GST: $181.60
(90759) GST Inc: **$1,997.60**

DES-1016R
16 Port Switch for Workgroups

Built with advanced functions, these switches are designed for the workgroups with advanced requirements. Powerful yet easy to use, they allow users to simply plug any port to either a 10Mbps or 100Mbps node to multiply bandwidth, boost response time and satisfy heavy load demand. Rack mountable.

GST Ex: $999 + GST: $99
(69456) GST Inc: **$1,098**

For all your small to medium business and home network needs please call for more information and pricing. We have an extensive range of fantastic D-Link products on our database.

DES-1024R
24 Port Switch for Workgroups

24 port Auto negotiating 10/100Mbit Switch (NWay). Supports UTP/STP cables. MDI-II Uplink ports Support Full/Half duplex. Provides cut-through and fast store & forward switching. Rack mountable.

GST Ex: $1356 + GST: $135.60
(76740) GST Inc: **$1,491.60**

DES-1008D
8 Port Fast Ethernet Switch

The D-Link DES-1008D is a powerful desktop Dual Speed 8-port 10/100Mb Ethernet/Fast Ethernet NWay auto-negotiating Switch.

GST Ex: $282 + GST: $28
(98254) GST Inc: **$310**

DI-701
Cable ADSL Gateway

The D-Link DI-701 Residential Gateway protects your computers from hackers or unwanted users. It is the easiest and safest way to share your high-speed Internet connection with a DSL Modem or Cable Modem.

NEW PRODUCT

GST Ex: $368 + GST: $36.80
(98249) GST Inc: **$404.80**

DP-601M
Internet Ready Server with Built-In Modem

1 x 10/100Mbs NWAY Ethernet Port, 1 x V.90/K56flex modem port. Supports NAT for single ISP user account, Dial-on-Demand, DHCP, PPP, PAP/CHAP Security.

GST Ex: $354 + GST: $3
(85107) GST Inc: **$389**

Other products available from D-Link

Description	Part #	Gst Ex	+ GST	GST In
D-Link DP-300 10/100 Print Server (1xSer,2xPar)	53598	$267	$26.70	$293.
D-Link DU-560M External V.90 56K Voice/Fax/Data Modem (USB)	98306	$108	$10.80	$118.
D-Link DFM-560I Internal PCI V.90 56K Voice/Fax/Data Modem	74361	$66	$6.60	$72
D-Link DES-3225G 22+2 port 10/100Mbs Mang Switch W/ V-Lan	90755	$1,872	$182.70	$2,009
D-Link DFE908DX 8 Port 10/100Mbs Dual Speed Hub	60558	$261	$26.10	$287
D-Link DFE-916DX 16 Port 10/100Mbs Dual speed hub	87207	$508	$50.80	$558
D-Link DFE2624x24-port 10/100Mbps Stackable Dual Speed Hub	98307	$1064	$106.40	$1,170
D-Link DP-602 2 Port Internet Network Server	81535	$338	$33.80	$371
D-Link DFE-530TX PCI-Bus 10/100Base TX Fast Ethernet Adapter	62956	$34	$3.40	$37

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Connectivity where & when you need it

3Com® Megahertz® 10/100 LAN+56K Global Modem CardBus PC Card

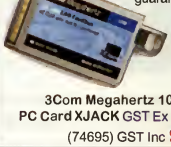
The 3Com® Megahertz® 10/100 LAN+56K* Global Modem CardBus PC Card delivers high-speed LAN and modem connections the world over. A 32-bit CardBus architecture ensures true 100 Mbps LAN performance and the V.90 56K standard delivers high-speed modem downloads. Plus, its durable autosensing XJACK® connector eliminates the need to carry any cables.

3Com Megahertz 10/100 LAN + 56K Global Modem with XJack GST Ex $396 + GST $39.60

(99215) GST Inc **$435.60**

3Com® Megahertz® 10/100 LAN CardBus PC Card with XJACK®

Get desktop manageability in a PC Card with the 3Com® Megahertz® 10/100 LAN. CardBus PC Card. XJACK® connector delivers durable connections without carrying or losing cables. And this PC Card provides true 100 Mbps Fast Ethernet performance in 32-bit CardBus notebooks. It features low power consumption, guaranteed compatibility,and DynamicAccess® technology.



3Com Megahertz 10/100 Cardbus PC Card XJACK GST Ex $275 + GST $27.50

(74695) GST Inc **$302.50**

HARRIS TECHNOLOGY @ Kmart

Broadway (Sydney) Burwood (Melbourne)

Kmart Shoppers! Not all products are in-store, but consulting & advice available on all items

3Com® OfficeConnect™ Dual 56K Modem

OfficeConnect Dual 56K LAN Modem brings low-cost, high-speed Internet and Ethernet connectivity to your Small Office/Home Office computers in just minutes! This product is designed for non-technical users that need radical simplicity, high speed Internet access as well as local file and print sharing capability.

GST Ex $668 + GST $66.80

(A3358) GST Inc **$734.80**

3Com® AirConnect™ 11 Mbps Wireless LAN Solution

AirConnect 11Mbps Wireless LAN PC Cards and Access Points deliver **simple**, **reliable** and **manageable wireless connections** at Ethernet speeds. Dynamic rate shifting and load balancing optimize connectivity, while access control features provide security. AirConnect simplifies network setup with its PowerBASE-T feature and Site Survey Utility. Once installed, the SNMP management facility and Web-based tools ensure easy network management and configuration.

3Com AirConnect™ Wireless Access Point GST Ex $1,764 + GST $176.40

(A1869) GST Inc **$1,940.40**

m AirConnect Wireless LAN Starter Pack GST Ex $2,630 + GST $263.00

(A1867) GST Inc **$2,893.00**

3Com AirConnect™ 11Mbps Wireless LAN PC Card GST Ex $322 + GST $32.20

(A1868) GST Inc **$354.20**

* Capable of receiving downloads at up to 56 Kbps and sending at up to 31.2 Kbps. Due to IC/FCC regulations on power output, receiving speeds are limited to 53 Kbps. Actual speeds may vary. Requires compatible analog phone line and server equipment. See www.3com.com/56k/ for details.

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Makes Networking Easy

Intel® InBusiness™ 4-port and 8-port Fast Hubs

Simple Fast Ethernet Connectivitiy for small Business networks

Intel® InBusiness™ are designed for speedy transfer of large files, database access, multimedia applications, and any othe ractivities that require faster network performance. A crossover port enables multiple hubs to be connected fornetwork expansion.

- Easily Connects devices to create Fast Ethernet networks
- Crossover port for expandability
- Autosensing 10/100 ports, requiring no configuration
- Covered by a limited lifetime warranty

8 Port Fast Hub
GST Ex $232 + GST $23.20
(57827) GST Inc **$255.20**

4 Port Fast Hub
GST Ex $161 + GST $16.10
(58546) GST Inc **$177.10**

Intel® InBusiness™ 10/100 Switches
Simple, increased network performance for standard Fast Ethernet

4 Port
GST Ex $200 + GST $20.00 GST Inc
$220.00
(A2295)

8 Port
GST Ex $267 + GST $26.70 GST Inc
$293.70
(73567)

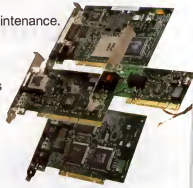
Intel® pro/100+ Management Adapters

Fast, manageable 10/100 network connections

Driver Compatibility - Intel compatiable network drivers lower cost of maintenance. Drivers configure quickly and easily with Intel® PROSet utility

Built-in advanced management capabilities
- Wake on LAN for remote system wake-up and troubleshooting
- PRO/100+ Boot agent for remote PC deployment and upgrades
- ACPI compliant for flexible powermanagment
- Desktop Management Interface (DMI) 2.0 for remote asset management
- Tivoli agent and Intel LANDesk® Client Manager included for easy management access

Leading performace
- Intel's Adaptive Technology increases network response time while keeping CPU utilization low
- Intel Priority Packet improves bandwidth control
- 10/100 autosensing full-duplex



PRO/100+ Management Adapte
GST Ex $152 + GST $15.20
(75328) GST Inc **$167.20**

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Intel® InBusiness™ Print Station

The Ideal Solution for small businesses needing to easily share resources and increase productivity

The Intel InBusiness Print Station is the easy way to share printers over a network. Setup is so simple that within minutes your small-business customers cna be printing to shared printers over 10Mbps ro 100Mbps network. The Intel InBusiness Print station is part of a complete line of networking products designed specifically for Small Busniess.

- Connects printers to the network independent of PC's
- Supports two printers with single 10BASE-T or 100BASE-TX connection.
- Increase productivity by conveniently locating printers
- Simple installation wizard
- Offers a complete solutions

GST Ex $288 + GST $28.80
(93464) GST Inc **$316.80**

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Worldwide Leader in Networking for the Internet

Cisco 800 Series

The Cisco 800 series router provides enhanced network security and reliability through the power of Cisco IOS software tailored for small offices and telecommuters. It is recommended for small offices of up to 20 users, connecting every user to the Internet or to the corporate LAN with one ISDN line.

NB- all software sold separately.

Cisco 801
1 Ethernet and 1 ISDN Basic Rate Interface (BRI)
GST Ex $1,263 + GST $126.30 (78662) GST INC **$1,389.30**

Cisco 803
4 – port shared Ethernet hub, 2 analog POTS, & 1 ISDN BRI
GST Ex $1,419 + GST $141.90 (72566) GST INC **$1,560.90**

Cisco 805
Frame Relay, leased line, or async dial-up access to the Internet
GST Ex $1,575 + GST $157.50 (80398) GST INC **$1,732.50**

Cisco 1600 Series

The Cisco 1600 is the proven choice for the flexible Internet / Intranet access for small branch offices and small businesses. In addition to one fixed WAN port and one Ethernet port, the Cisco 1600 models support one WAN interface card, which allows customers to add or change WAN ports as needed. WAN options include ISDN, Frame Relay and X.25.

NB- all software sold separately.

Cisco 1601 – R
One serial port with synchronous performance up to E1 speeds for Frame Relay and X.25 WAN services, or async performance up to 115.2 kbps. Higher speed than ISDN.
GST Ex $2,440 + GST $244.00 (79373) GST INC **$2,684.00**

Cisco 1603 – R
ISDN (BRI) and ISDN leased line connectivity
GST Ex $2,440 + GST $244.00 (A0132) GST INC **$2,684.00**

Cisco 1720 Series

The Cisco 1720 access router delivers a flexible, integrated solution for small / medium businesses and small branch offices that want to deploy secure Internet, Intranet, and Extranet access. The Cisco 1720 is a fully modular solution that provides the access router, optional high-speed encryption, a VPN tunnel server, IPSec, and a dynamic firewall. This solution enables you to minimize your setup costs and reduce the ongoing time and expense required to manage the network.

NB- all software sold separately.

Cisco 1720- An integrated routing solution that delivers optimised security and flexibility in a desktop form factor for small / medium businesses or small branch offices interested in deploying Internet, Intranet and Extranet access. Modular WAN slots to support future growth by providing upgradeable WAN services and higher densities of WAN connections. Features and performances to support new world services including VPN's and broadband technologies. Support for encrypted WAN performances greater than 128kbps. Router configurations that require two ISDN BRI interfaces. An autosensing 10/100 Mbps Fast Ethernet LAN connection to provide easy upgrade to Fast Ethernet.
GST Ex $1,958 + GST $195.80 (71554) GST INC **$2,153.80**

Cisco Catalyst 2900 Series XL

Cisco's Catalyst 2900 Series XL is a full line of stand alone, 10 /100 autosensing Fast Ethernet switches that combine outstanding performance, ease of use, and integrated Cisco IOS software.

Catalyst 2912XL
Switch for connecting smaller Ethernet Fast Ethernet workgroups or servers
Low entry price
GST Ex $1,555 + GST $155.50 (74277) GST INC **$1,710.50**

Catalyst 2924C XL
Dedicated 10 – Mbps or 100 – Mbps connections to individual PC's, servers, and other systems. High-speed uplink flexibility over extended distances with 100BaseFX connections (Catalyst 2924C XL only)
GST Ex $3,669 + GST $366.90 (78298) GST INC **$4,035.90**

- Prices include tax - Software needs to be purchased separately - Prices are subject to change without notification

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Modems and Multimedia

Full Product Info: www.dynalink.com.au

Dynalink Internal 56k V.90 Modems

ISA: All the features of the External. Manually Configurable Jumper Settings.
5-Year Warranty.
GST Ex $108
+ GST $10.80 (77577)
GST INC **$118.80**

PCI: PnP, Send & Receive Faxes, Phone Answer Machine.
GST Ex $67
+ GST $6.70 (72909)
GST INC **$73.70**

PC-Card

- PCMCIA V.90 56k Modem
- Send & Receive Faxes
- 5-Year Warranty

GST Ex $123
+ GST $12.30 (A2831)
GST INC **$135.30**

Dynalink 56K Voice/Fax/Data Speakerphone Modem

"Good value for money... ease of setup and use is excellent... consistently connects at high speeds." *PC World Nov 99.* • V.90 / K56flex dual-mode for high Internet compatibility • Plug & play, plus friendly QuickGuide for easy installation • Send and receive faxes from your PC • Supports FaxStream DUET, Caller ID, Speakerphone Mode & VoiceMail.

5 Year Warranty

GST Ex $123
+ GST $12.30
(54361) GST INC
$135.30

Dynalink USB Pocket Modem

5-Year Warranty

- Super-easy Installation.
- Free-up Slots and IRQs.
- No power supply, no messy cables.
- Dual-mode V.90, fax machine, answer machine.
- Pocket sized for convenience and style!

GST Ex $126 + GST $12.60 (A2298) GST INC **$138.60**

NEW! Dynalink USB WebCam

- Turn your PC into a home video workstation.
- Affordable & simple video conferencing.
- Capture video and digital snapshots.
- E-mail video clips.
- Home security capabilities.
- Video software VP-EYE suite included.
- USB simplicity.

GST Ex $89 + GST $8.90
(A2832) GST INC **$97.90**

MagicXpress TView Video Capture Card

"One of the two best cards in terms of picture quality" *APC, July 9.* Watch TV on your PC & capture incoming video (e.g. from CamCorder). Fully featured, including Teletext & remo control. Resizable window, right up to full-screen (640x480).

Standar
GST Ex $113 + GST $11.
(72860) GST INC **$124.3**
With FM Tune
GST Ex $147 + GST $14.7
(78482) GST INC **$161.7**

Purchase any Dynalink modem & enjoy

6 MONTHS FREE INTERNET

*Six months of free internet hours with TPG is available in: Sydney, Penrith, Gosfo Kiama/Wollongong, Lake Macquarie, Newcastle, Melbourne, Brisbane, South-po Gold Coast, Canberra, Adelaide, Perth, Hobart, Launceston and Darwin.
**one-off $43.95 admin fee. 300MB Download limit per month.
Unlimited 3 hour connections. Offer available for a limited time.*

Verbatim

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Storage for life

Full Product Info: www.verbatim.com.au

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Verbatim Signature III Colour CD Printer

The Signature III Colour CD Printer is a new, third generation ink-jet CD Colour printer from industry leader Primera Technology. It combines the fastest print speed ever offered with the highest print resolution available in the world today: 1200x1200dpi for a stunning 1.44 million pixels per square inch.

GST Ex: $2,459 + GST: $245.90
(89186) GST Inc **$2,704.90**

Also available, the Champion Comet is the first economical, desktop printer loader designed for the Signature II and III printers. The loader stacks up to 50 printable discs, then after printing, the discs are deposited into the output tray.

Comet Autoloader for Signature Printers
GST Ex: $2,411 + GST: $241.10 (97769) GST Inc **$2,652.10**

Verbatim CopySmart 4x4x32 CD Duplicator

Stand-alone or PC connected one-to-duplicator able to record to both CD-R and RW media. 4x CD-R, 4x CD-RW copy funct Simple 4 button interface allowing Speed selec Test, Copy, Compare and Quick Erase. based Data and Audio copying Software incl

4x Write, 4x ReWrite, 32x Read

LOW

GST Ex: $1,520 + GST: $152.00 (9
GST Inc **$1,672**

Verbatim Slim-line PC Card CD-ROM Drive

Add a CD-ROM to your Laptop!

This 24xCD-ROM can connect to any PC Card enabled PC or Notebook and is ideal for mobile computing for notebook users with no CD-Rom drive built-in. The drive is plug-and-play making installation a breeze and the slim-line tray reduces the size of traditional external PCMCIA CD-ROM drives through its lightweight and low profile design. The control panel on the top of the case allows for easy playback of audio CD's.

GST Ex: $287 + GST: $28.70 (97766) GST Inc **$315.70**

Verbatim 56K Compact Modem

Compatible with Windows® CE based P PCs & Handheld PCs

The Pretec CompactModem from Verbatim is the v first and smallest 56kbps Fax/Modem card for Wi CE based Palm PCs and handheld PCs. conferencing ready. Supports V.80 applicat synchronous H.324 streaming. Supports V.9 K56flex. Win 95/98/NT /CE compatibl connecting the CompactFlash adapter inc this modem also becomes a fully-fledged P able to be used with most laptops/notebooks.

GST Ex: $255 + GST: $25.50 (83607) GST Inc **$280**

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CD-R/CD-RW: Storage for life

Verbatim CD's represent the latest in technology. Featuring a proprietary blue Metal-Azo dye which has the best resistance to sunlight, silver reflective layer for optimum read and write performance and multispeed recording.

Verbatim CD Recordable and Rewritable Discs

CD Recordable- 10 Pack

74 Min. 650 MB 1x - 12x 10 pack

GST Ex: $20
+ GST: $2.00
(76731) GST Inc:
$22.00

CD Recordable- 10 pack in sleeves

74 Min. 650 MB Multispeed Envelope 10 pack

GST Ex: $18
+ GST: $1.80
(A3160) GST Inc:
$19.80

CD Recordable- Singles

74 Min. 650MB Multispeed Singles

GST Ex: $2
+ GST: $0.20
(74740) GST Inc:
$2.20

CD Recordable- 80 Minute

74 Min. 650 MB Multispeed

GST Ex: $2
+ GST: $0.20
(87392) GST Inc:
$2.20

CD Recordable- Printable Surface

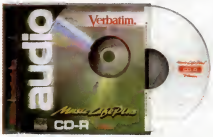
74 Min. 650 MB Printable Surface 50 spindle pack

GST Ex: $90
+ GST: $9.00
(93471) GST Inc:
$99.00

*Printable surface also available in jewel-case

Audio CD Recordable

74min Audio CD Recordable



GST Ex: $3
+ GST: $0.30
(A2336) GST Inc:
$3.30

CD Rewritable

33MB CD Rewritable Preformatted for Direct CD

GST Ex: $6
+ GST: $0.60
(A3171) GST Inc:
$6.60

NEW!

CD Rewritable

650 MB CD Rewritable 2x 4x

GST Ex: $5
+ GST: $0.50
(77492) GST Inc:
$5.50

CD Travel Case

Lightweight. Scuff proof exterior. Fabric lined disc holders prevent scratching and sticking of CD's.

For 24 CDs:
(79583)
GST Ex:$18
+ GST: $1.80
GST Inc:
$19.80

For 48 CDs:
(79584)
GST Ex:$25
+ GST: $2.50
GST Inc:
$27.50

Headset with Microphone

Vertical in-ear stereo headphone with adjustable microphone boom. Ideal for notebook users. Designed for multimedia convenience. Lightweight and compact, adjustable headband. (Must be powered by a soundcard)
(77819)
GST Ex:$17
+ GST: $1.70
GST Inc:
$18.70

Logitech

Now you can collect Fly Buys points when you purchase from Harris Technology

Web Direct www.ht.com.au/cat/logitech

Surround yourself with the very best

Mini Wheel Mouse

GST Ex: $64
+ GST: $6.40
(97717)
GST Inc:
$70.40

MouseMan Wheel Optical

GST Ex:$89
+ GST: $8.90
(A3057)
GST Inc:
$97.90

NEW!

TrackMan Live

Cordless freedom for interactive presentations, works up to 10 metres away from the computer.
GST Ex:$239
+ GST: $23.90
(77753)
GST Inc:
$262.90

Fly Buys 5x Bonus Points

Collect 5 Fly Buys points for every $5 spent when you purchase 82772, 87605,80121, A2833, 70566, A2157, A2300 or 78677 between 20/8/00 - 30/9/00

SEP 30

Cordless Desktop iTouch

A cordless keyboard and cordless wheel mouse combination to free you from cords that tangle. No pointing at the computer or clear path required. With convenient iTouch Internet and multimedia controls. Five-year warranty.

Fly Buys 5x Bonus Points

GST Ex: $152
+ GST: $15.20
(82772)
GST Inc:
$167.20

Cordless Desktop Pro

Cordless keyboard designed for easier typing and contour soft-touch cordless wheel mouse free you from tangled cords. Innovative mouse design maximises comfort and control. Five-year warranty.

Fly Buys 5x Bonus Points

GST E
$2
+ G
$20.
(876
GST I
$226.

QuickCam™ Express

Snap stills. Shoot video. Email them anywhere in one click. Make live video calls! ***QuickCam™ Express*** – The simple way to get closer™.

- Capture stills and video instantly
- Email images with a single click
- Meet face-to-face online
- Over 3 million QuickCams sold
- USB connector for easy installation
- Works with Windows® 95 or 98

Fly Buys 5x Bonus Points

GST Ex: $81 + GST: $8.10
(80121) GST Inc: **$89.10**

QuickCam™ Web

The redesigned Logitech QuickCam Web has everything yo need to capture video, send video e-ma make live video calls, post web album broadcast over the Internet and mo With its integrated microphone and excellent assortment of easy-to-us software, QuickCam Web is the perfect Internet video camera for everyone.

NEW!

Fly Buys 5x Bonus Points

GST Ex: $1
+ GST: $15.
(A2833) GST Inc: **$173.**

QuickCam™ Pro USB

True 640x480 resolution for stunning videos & pictures. With the ***QuickCam*** software, build fun web pages complete with streaming video or make live video calls (includes a Labtec microphone) over the Internet. Add titles, fade-in & fade-outs, audio tracks & more to your videos. Enhance your pictures with special effects such as sharpen, blur & more. And with the included digital surveillance software, easily set up a digital security camera.

Fly Buys 5x Bonus Points

GST Ex: $193 + GST: $19.30
(70566) GST Inc: **$212.30**

CordlessTrackMan Whee

Experience true comfort and freedom. Thanks Digital Radio technology, this innovative trackball works without being pointed at computer, even on crowded desks. Patented optical technology delivers superior precision, reduced wear a smooth tracking. Five-year warrant

NEW!

Fly Buys 5x Bonus Points

GST Ex: $150 + GST: $15
(A2157) GST Inc: **$165**

Cordless Wheel Mouse Special Edition

Personalise your mouse with the three different colored snap-on backs. The Cordless Wheel Mouse frees you from cords that catch, tangle and limit your movement. The rounded shape is comfortable for left or right hand. 5-year warranty.

NEW!

Fly Buys 5x Bonus Points

GST Ex: $72 + GST: $7.20
(A2300) GST Inc: **$79.20**

Cordless MouseMan Whe

Cordless MouseMan Wheel combines cordl freedom of movement and a comfortable shape with unique soft-touch sides, an easy-scrolling wheel and four customiz buttons. It eliminates the struggle with cords, works without being pointed at computer and performs on crowded desks. Five-year warranty.

NEW! LOW PR

Fly Buys 5x Bonus Points

GST Ex: $81 + GST:
(78677) GST Inc: **$89**

HARRIS TECHNOLOGY™

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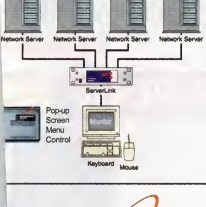
subject to approv

Multi-Server Controllers

Control up to 256 network servers with a single monitor, keyboard & mouse

3 Year Warranty

With a ServerLink KVM switch you can monitor and fully control up to 256 network servers with just one monitor, keyboard and mouse. Save money on expensive monitors, create more working space and cut down on your power costs.



Designed and manufactured in Australia by an award winning engineering company, ServerLink is packed with features, providing total control of your ever expanding network.

- Select servers via On-Screen-Display or Front Panel
- Name servers for simple selection
- Mouse & keyboard emulation for flawless booting
- Scan Mode for periodic server monitoring
- Standard cables used throughout
- Cascadeable to control up to 256 servers
- 8 and 16 port models 19 inch rack mounted design
- Australian designed and manufactured

FROM **$349.80**

ServerLink to computer cable

Each end of the cable fans out into three connectors.

2m cable for **PS/2** mouse, keyboard and monitor
GST Ex $26 + GST $2.60 (63972) GST INC
$28.60

5m cable
GST Ex $58 + GST $5.80 (63976) GST INC
$63.80

2m cable for **AT/Serial** mouse, keyboard and monitor
GST Ex $25 + GST $2.50 (63974) GST INC
$27.50

5m cable
GST Ex $56 + GST $5.60 (63977) GST INC
$61.60

ServerLink™

- EPROM upgradeable for future technology
- Supports PS/2 and Serial mouse emulation

SL-401E	4 Port ServerLink Controller for PS/2 only	GST Ex $318 + GST $31.80 (71652) GST INC **$349.80**
SL-401	4 Port ServerLink Controller	GST Ex $670 + GST $67.00 (63724) GST INC **$737.00**
SL-801	8 Port ServerLink Controller	GST Ex $1,119 + GST $111.90 (63777) GST INC **$1,230.90**
SL-1601	16 Port ServerLink Controller	GST Ex $1,881 + GST $188.10 (63778) GST INC **$2,069.10**

SERVERLINK INFINITY

PS-2 ONLY

- Password protection for security
- Flash ROM upgradeable for future technology

L-821	8 Port ServerLink Infinity controller	GST Ex $974 + GST $97.40 (97888) GST INC **$1,071.40**
L-821-P	8 Port ServerLink Infinity controller incl 8x2m Cables	GST Ex $1,131 + GST $113.10 (97889) GST INC **$1,244.10**
-1621	16 Port ServerLink Infinity controller	GST Ex $1,633 + GST $163.30 (97890) GST INC **$1,796.30**
-1621-P	16 Port ServerLink Infinity controller incl 16x2m Cables	GST Ex $1,934 + GST $193.40 (97891) GST INC **$2,127.40**

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Kodak

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Taking Pictures Further

Kodak Accessories

32MB Picture Card (62677)
GST Ex:$156 + GST: $15.60 GST Inc:
$171.60

64MB Picture Card (82249)
GST Ex:$241 + GST: $24.10 GST Inc:
$265.10

96MB Picture Card (88332)
GST Ex:$369 + GST: $36.90 GST Inc:
$405.90

Premium Camera Bag (82273)
GST Ex:$53 + GST: $5.30 GST Inc:
$58.30

80 Minute Ultima (94493)
GST Ex:$2 + GST: $0.20 GST Inc:
$2.20

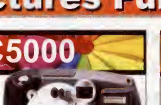
Kodak Gold 10 Pack (53993)
GST Ex:$21 + GST: $2.10 GST Inc:
$23.10

Fly Buys 1,000 Bonus Points

Collect 1000 Bonus Fly Buys points when you purchase A3295, 80361 or 84735 between 20/8/00 - 30/9/00

SEP 32

Kodak DC5000



Rugged, durable, and easy-to-use, the KODAK DC5000 will help you get the job done. Whether you're in the construction industry, insurance, or an outdoor enthusiast, the DC5000's weatherproof body will hold up under the toughest circumstances. Two-megapixel resolution provides you with excellent picture quality even on 8" x 10" prints. The 2X optical (30 – 60 mm) and 3X digital zoom let you choose wide angle or telephoto to take pictures in a variety of open spaces. All in all, a practical, intuitive package that is as easy to use as a point and shoot, but tough on the job

GST Ex: $1,177 + GST: $117.70 (A3540) GST Inc: **$1,294.70**

Kodak DC4800

NEW

For passionate digital photographers or those needing the highest possible quality or the widest creative control. Compact size. 3.3 megapixels - super crisp resolution; prints up to 11"x17". Six image qualities, from e-mail to uncompressed Tif. Loaded with features. Variable ISO settings (100, 200, 400). Wide angle 3x optical zoom plus 2x digital zoom. Lithium Ion rechargeable battery (rechargeable in camera). Manual & auto settings. Variable colour balance. TTL AF. Special effects. Lens threaded for additional external lenses.

GST Ex: $1,471 + GST: $147.1 Burst capture mode." (A3295) GST Inc: **$1,618.1**

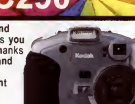
Kodak DC280

Fast, responsive and sophisticated, the KODAK DC280 means business. Its intuitive design and responsive performance mean there's little learning curve. The DC280 lets you capture business images quickly and professionally. And then put them to work immediately.

- 2 Million Pixel Resolution
- 2x Optical and 3x Digital Zoom Lens
- USB compatible
- 8MB Picture Card
- PhotoDeluxe Pegemill and Photoprinter Software
- Rechargeable batteries and charger included

GST Ex: $805 + GST: $80.50 (80361) GST Inc: **$885.50**

Kodak DC290



The model of choice for high-end business picture takers. It gives you the ultimate in digital control thanks to its ability to "learn" scripts and applications—much like you'd customize your PC with different software.

- 2.1 Million Pixel Resolution
- Up to 3.3 Million Pixel Interpolated Resolution
- 3x Optical and 2x Digital Zoom
- JPEG and Uncompressed TIFF File Format
- Audio record and playback
- Burst capture mode
- 16MB Picture Card
- Rechargeable batteries/ charger included

GST Ex: $1,075 + GST: $107. (84735) GST Inc: **$1,182.5**

Kodak EZ200

NEW!

Low cost digital point-and-shoot camera that's also a PC/web camera. Compact & light. VGA camera - ideal for easily emailing pictures. Capture short video clips and share via video email. Portable like a traditional camera, but included software also allows camera to be tethered to PC for live video calls. Burst mode for action shots. USB interface. 4Mb internal memory. With removable/adjustable base to allow full tilting & swivelling.

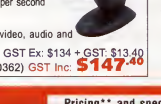
GST Ex: $Call + GST: $Call (xxxxx) GST Inc: **$Call**

Kodak PalmPix

- Compatible with Palm III, IIIx, IIIe, VII, IBM Workpad and TRGPro.
- Portable: Take it everywhere
- Quick- take a picture, transfer by HotSync technology, and share it in seconds
- Color VGA Pictures- 640x480 pixel resolution.
- Zoom- 2x digital zoom
- Windows 95, 98, nT 4.0 or later compatible

GST Ex: $281 + GST: $28 (A2310) GST Inc: **$309.**

Kodak DVC 325



The KODAK DVC325 Digital Video Camera is the easy, fun way to capture and share quality digital pictures and video

- Full motion video up to 30 frames per second
- Great 640x480 Still Images
- USB interface
- Create videos that include text, video, audio and special effects with Presto! Videoworks software included
- Standard Tripod Socket

GST Ex: $134 + GST: $13.40 (80362) GST Inc: **$147.40**

Kodak 4832 External USB Writer

NEW USB, 4x CDR Write, 4x CDRW Re-Write, Up to 8x Read. Dimensions 195(w) x 60(h) x 247(d) mm, Weight 2.53Kg. USB supported by Windows 98. PACKAGE CONTENTS- Your Kodak USB CD-R/RW drive, Recording Software CD and CD-R/RW drive Driver CD, USB connection cal Power cable with universal power supply, KODAK Ultima CDR, KODAK 4832e User Manual.

GST Ex: $531 + GST: $5 (A2330) GST Inc: **$584**

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Connected Organisers

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Excellent Palm™ Computing from Harris Technology

Palm™ connected organisers manage life's little details. It will help you stay on top of things everywhere you go. You can store thousands - literally thousands - of names, addresses, phone numbers, to-do's, and expenses, plus hundreds of e-mail messages. You can synchronise all your information with your computer at the touch of a button. More features: Infrared communication. Access your e-mail with the Palm Modem® accessory. Applications: Date Book, Address Book, Mail, To-do List, Memo Pad, Expense, Calculator, Security, Games, HotSync®.

Palm m100

Connected Organiser

Compact, slim & stylish

NEW PRODUCT COMING SOON!

Stock expected early September

T [illegible] ail

(xx) G [illegible]

Call

Palm IIIc™

Connected Organiser

Colorful

FLY BUYS 2,000 BONUS POINTS

The Palm IIIc™ combines functionality and speed with advanced screen technology that renders a vivid, clear colour display. A rechargeable lithium ion battery lasts more than two weeks with normal use, and recharges in your HotSync® cradle in just minutes a day. An optional recharger kit is great when you're away from your PC.

Stores approximately: • 10,000 addresses • 5 years of appointments • 3,000 to-do items • 3,000 memos • 400 e-mail messages • and lots of third-party applications.

GST Ex $690 + GST $69.00

(95059) GST INC

$759.00

Palm Vx™

Connected Organiser

Slim, stylish, more storage

FLY BUYS 2,000 BONUS POINTS

If you're looking for the sleekest device on the market, look no further than the Palm Vx™ organiser. Weighing in at just 114 grams., it has the same anodised aluminum exterior and LCD screen as the Palm V™ organiser. Yet it has four times the memory of its predecessor, giving you more speed and more storage. Stores approximately: • 10,000 addresses • 5 years of appointments • 3,000 to-do items • 3,000 memos • 400 e-mail messages • and lots of third-party applications.

GST Ex $663 + GST $66.30

(95061) GST INC

$729.30

Palm™ Portable Keyboard

e your laptop in the office. this pocket-sized keyboard to notes at your next meeting or reports on an airplane. Folds small. Weighing in at less 250 grams, this full-size oard tri-folds into a size just y bigger than a Palm™ iser itself. Unfolded, it's the size as your desktop ard. No batteries required.

Tri-fold Keyboard Goes Anywhere!

GST Ex $197 + GST $19.70

(87210) GST INC **$216.70**

Buy a Palm Vx during September and get a FREE* half bottle of Johnnie Walker Black Label Scotch Whisky includes free Delivery

*Redeemable via Vintage Cellars On-line www.vintagecellars.com.au or phone 1300 366 084 just quote our ref number. Redemtion is only available to persons over the age of 18.

VINTAGE CELLARS

FLY BUYS 2,000 BONUS POINTS

Collect 2000 Bonus Fly Buys points when you purchase 95059 or 95061 between 20/8/00-30/9/00

Palm Slim Leather Case
GST Ex $35
+ GST $3.50
(63801)
GST INC **$38.50**

Palm III 3-pack Styli
GST Ex $15
+ GST $1.50
(60675) GST INC **$16.50**

Palm III Cradle
GST Ex $50
+ GST $5.00
(60673)
GST INC **$55.00**

Palm V Cradle
GST Ex $95
+ GST $9.50
(74669) GST INC **$104.50**

Palm V Leather Belt Clip Case
GST Ex $46
+ GST $4.60
(74673) GST INC **$50.60**

Palm V Modem
GST Ex $259
+ GST $25.90
(74668)
GST INC **$284.90**

Palm V Hard Case
GST Ex $67
+ GST $6.70
(74676)
GST INC **$73.70**

Palm V Travel Kit
HotSync cradle, plug adapters and AC charger
GST Ex $82
+ GST $8.20
(74677) GST INC **$90.20**

Palm III series PalmGlove
Black:
GST Ex $44
+ GST $4.40
(82231)
GST INC **$48.40**
Also avail: purple, olive, royal blue, teal and yellow

Palm III series Colour Shades
Pack of 3 flip covers in blue, lime & aqua + 3 black plastic styli.
GST Ex $21
+ GST $2.10
(60677)
GST INC **$23.10**

SEP 33

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Smart Storage Solutions

Check for latest prices & products

Zip 100MB disk: (23772) GST Ex: $19 + GST: $1.90 GST Inc: **$20.90**

10-pack: (21889) GST Ex: $155 + GST: $15.50 GST Inc: **$170.50**

Zip PCMCIA SCSI accelerator card (35145) GST Ex: $158 + GST: $15.80 GST Inc: **$173.80**

Zip ISA SCSI Zoom accelerator card (21888) GST Ex: $53 + GST: $5.30 GST Inc: **$58.30**

Zip drive carry case (31823) GST Ex: $42 + GST: $4.20 GST Inc: **$46.20**

Zip parallel cable (46305) GST Ex: $35 + GST: $3.50 GST Inc: **$38.50**

Zip SCSI cable (46304) GST Ex: $33 + GST: $3.30 GST Inc: **$36.30**

Zip disk labels 20-pack (48059) GST Ex: $3 + GST: $0.30 GST Inc: **$3.30**

Zip 6-disk wallet (35146) GST Ex: $23 + GST: $2.30 GST Inc: **$25.30**

Jaz 1GB disk (24218) GST Ex: $144 + GST: $14.40 GST Inc: **$158.40**

3-pack (32844) GST Ex: $418 + GST: $41.80 GST Inc: **$459.80**

Jaz PCMCIA SCSI card (44744) GST Ex: $197 + GST: $19.70 GST Inc: **$216.70**

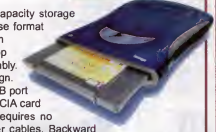
Jaz universal power supply (35154) GST Ex: $44 + GST: $4.40 GST Inc: **$48.40**

Clik!Power Supply (78925) GST Ex: $26 + GST: $2.60 GST Inc: **$28.60**

ZIP USB

Zip 250MB

Provides high-capacity storage in an easy-to-use format that can go from desktop to laptop quickly and reliably. Sleek new design. Connect via USB port or through PCMCIA card version which requires no additional power cables. Backward compatible with 100MB Zip media



ZIP 250MB USB:
GST Ex: $295 + GST: $29.50 (82633) GST Inc: **$324.50**

Drive USB/PC card Combo
GST Ex: $354 + GST: $35.40 (82780) GST Inc: **$389.40**

ZIPCD USB

CD-RW External 4 X 4 X 6

The ZipCD™ external USB drive reads, writes and rewrites most CD formats. You can use it to record, back up, and share your files.

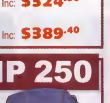
- It's portable and hot-swappable, letting you connect it to all USB enabled computers without rebooting.
- It enables you to record and erase ZipCD™ discs up to 1000 times.
- Enable PC and Macintosh® computer users to record, archive, share, and distribute up to 650MB of data on a common CD format.

GST Ex: $449 + GST: $44.90
(92623) GST Inc: **$493.90**

ZIP 250

Zip 250MB

Comes with 1 Zip 250MB disk. Iomega tools supplied on CD.



SCSI: GST Ex: $253 + GST: $25.30
(74451) GST Inc: **$278.30**
Disks: Single: GST Ex: $28 + GST: $2.80
(74454) GST Inc: **$30.80**
Disks: 10-pack: GST Ex: $268 + GST: $26.80
(74452) GST Inc: **$294.80**

ZIPCD

CD-RW Internal 8 X 4 X 32

NEW

Store your personal photos, original audio and video creations, multimedia presentations and data files. Backup your files & save space on your hard drive.

GST Ex: $402 GST: $40.20
(97712) GST Inc: **$442.00**

JAZ

Jaz 2GB External

GST Ex: $545 GST: $54.50
(78941) GST Inc: **$599.50**

The external Jaz 2GB drive is faster than many hard drives, has a full 2GB of storage space in each removable disk.

Does not include Jaz disk.

Disk Single:
GST Ex: $152 + GST: $15.20 (61652) GST Inc: **$167.20**
Disk 3-pack:
GST Ex: $416 + GST: $41.60 (57271) GST Inc: **$457.60**
Jaz Firewire dongle: SCSI to USB connector
COMING SOON!!!

CLIK!

PC Card Drive

Removable solution for notebook users. Store, protect and share important information on a 40MB Clik! (1 disk included).

Clik! USB docking station
GST Ex: $109 + GST: $10.90 (A2306) GST Inc: **$119.90**
Clik! Drive PC Card and disk
GST Ex: $238 + GST: $23.80 (78902) GST Inc: **$261.80**
Clik! Drive Mobile
GST Ex: $445 + GST: $44.50 (76743) GST Inc: **$489.50**
Clik! Disks 10-pack
GST Ex: $169 + GST: $16.90 (75985) GST Inc: **$185.90**

NEW

Zip 100MB USB Starter kit

USB Easy to connect. Comes with 3 disks. Plug it in, connect the USB cable to the computer, and install the IomegaWare™ software. Done!

GST Ex: $235 + GST: $23.50 (A2308) GST Inc: **$258.50**

SPECIAL OFFER

With any purchase of a Zip 250MB, Jaz, Clik! or ZipCD drive...

receive a 3 month subscription to Australian Net Guide at no extra cost. And enter the dra to win free internet access for a year!

This promo ends 30th Sept 2000.

See www.ht.com.au/cat/iomega for more info on these produc

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Tools for the "E" Generation

ePhoto CL18

Dual Mode: (point-and-shoot digital camera with video conferencing, video clipping and video e-mailing features), VGA (640 x 480 pixels) optical resolution with CMOS sensor, 32 images on internal 2Mb memory (non removable), Optical viewfinder, Built-in Flash, ISO 200, Includes camera cradle for video conferencing, USB interface. Excellent s/w bundle (Twain driver, Corel PrintHouse, Corel PhotoHouse, Microsoft NetMeeting, ArcSoft VideoImpression)

GST Ex: $293 + GST: $29.30
(99757) GST Inc: **$322.30**

SnapScan e50

1200 x 2400 optical resolution (9600 maximum), 42 Bit, USB interface, Integrated TPO for transparency and negative scanning, 4 front panel buttons (programmable), 3 interchangeable coloured handles and button covers. Agfa ScanWise and comprehensive software package including Corel Print Office 2000 and Readiris.

GST Ex: $382 + GST: $38.20
(99759) GST Inc: **$420.20**

ePhoto CL30 Clik!

The fantastic ePhoto CL30 now available with built-in Iomega Clik! Drive. Mega-pixel digital camera with USB interface and a resolution of 1440x1080 pixels. Features an optical viewfinder and 1.8" colour LCD screen. Auto focus lens with 2x digital zoom and macro function.

GST Ex: $989 + GST: $98.90
(89409) GST Inc: **$1,087.90**

SnapScan 1212u

One pass, high quality 600x1200ppi scanner (9600ppi max.) with USB interface. Includes Caere Omnipage LE OCR, Caere PageKeeper, Corel Print-House Magic Select & Agfa's incredible ScanWise software. Mac and Win98/Win2000 compatible **"Best Scanner 1999" - PC World magazine**

White
GST Ex: $192 + GST: $19.20
74496) GST Inc: **$211.20**

SnapScan Touch

Agfa's revolutionary Snap-Scan Touch USB Scanner has four programmable buttons: scan direct to file, email, fax or printer. 600x 1200 ppi, 36 bit, landscape desktop scanner. Comes with 7 translucent coloured handles! Software: Agfa ScanWise, Caere OmniPage LE, Caere PageKeeper (PC only) Micro Frontier Color IT! (Mac only) and Corel Print House

GST Ex: $208 + GST: $20.80
(87209) GST Inc: **$228.80**

SnapScan 1212p

One pass, high quality 600x1200ppi scanner (9600ppi max.) with parallel interface. Includes Caere Omnipage LE OCR, Caere PageKeeper, Corel Print-House Magic Select & Agfa's incredible ScanWise software. Compatible with Win95/98/NT. 36-Bit

ST Ex: $163 + GST: $16.30
74495) GST Inc: **$179.30**

SnapScan e40

1200x2400 optical resolution (9600 maximum), 42bit, USB interface, 3 interchangeable coloured handles. Agfa bundles Corel Print Office 2000 and Readiris. Corel Print Office makes it easy to create impressive documents and Web pages. Readiris, which recognizes 55 languages, lets users easily convert hard-copy documents — originals, faxes and photocopies — into editable text. All software provided is available in 5 languages, for both Windows (including Windows 2000) and Macintosh platforms.

GST Ex: $313 + GST: $31.30
(84306) GST Inc: **$344.30**

More from Agfa...

DuoScan HiD (92981)
GST Ex: $3,476 + GST: $347.60
GST Inc: **$3,823.60**

Transparency adapter for SnapScan 1236. Moving light source. 203x254mm. (76779)
GST Ex: $276 + GST: $27.60
GST Inc: **$303.40**

Document Feeder for DuoScan T1200. (75581)
GST Ex: $379 + GST: $37.90
GST Inc: **$416.90**

Batch Slide holder set for DuoScan T1200. (75582)
GST Ex: $203 + GST: $20.30
GST Inc: **$220.30**

DuoScan T1200 SCSI-2. 36 bit. Transparency scanning. Opt. res. 600x1200ppi (74498)
GST Ex: $1,244 + GST: $124.40
GST Inc: **$1,368.40**

DuoScan T2500 SCSI-2. 36 bit. Transparency scanning. True opt. res. 1250ppi (74499)
GST Ex: $7,995 + GST: $799.50
GST Inc: **$8,794.50**

HP ScanJets

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Purchase a HP ScanJet 3400C, 4300C or 5370C between 20/7/00 & 30/9/00 and receive Quintuplet Fly Buys points!

HP ScanJet 3400C

Easy scanning, copying and e-mail!

- WSYWYG capability
- Dual I/O: USB & Parallel interface
- 600 dpi optical
- 36 bit colour
- Presicion Scan LTX software

GST Ex $262 + GST $26.20 (A2285)

GST INC **$288.20**

HP ScanJet 4300C

Scan/copy/e-mail from a brand you can trust

- WYSWYG compatability
- Dual I/O: USB & Parallel
- 600 dpi optical - 36 bit colour
- Windows 2000 support
- Presicion Scan LTX software
- Corel Print House 2000

GST Ex $343 + GST $34.30 (A2286)

GST INC **$377.30**

HP ScanJet 5370C

Multiformat - Scan/copy/ e-mail and fax

- 1200 dpi optical resolution
- 42 bit colour
- Active XPA included
- Negatives support
- Dual I/O: USB & Parallel
- Active transparancy adapter
- Mac drivers
- Presicion Scan Pro 2.5

GST Ex $513 + GST $51.30 (A226

GST INC **$564.3**

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HP DeskJets

HP DeskJet 640C

HP's easy, everyday colour inkjet printer

- Black and colour cartridges included - everything you need!
- Great results on plain paper
- Special projects made simple - greeting cards, envelopes & more
- Prints up to 6 ppm black and 3 ppm colour

GST Ex $171 + GST $17.10 (A2288)

GST INC **$188.10**

HP DeskJet 840C

HP's creative photo-quality colour, speed and flexibility

- Photo-quality with HP PhotoREt II
- Alturnative 600x1200 dpi mode on photo paper
- Prints up to 8 ppm black and 5 ppm colour
- Exclusive HP inks dry fast for smudge-resistant text and images

GST Ex $294 + GST $29.40 (A2289)

GST INC **$323.40**

HP DeskJet 1125C

HP's affordable wide-format colour printer

- Print any size from postcards (A6) to posters (A3+)
- Prints up to 7ppm black and 5.5 ppm colour
- Booklet printing - two-sided printing with automatic arrangement of pages for bindi

GST Ex $543 + GST $54.30 (A

GST INC **$597.**

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HP OfficeJets

HP OfficeJet T45
All Colour: Printer, Copier, Scanner & Fax

600x600dpi InkJet Printer with HP PhotoRET II
Up to 9ppm print speed (black) and 6.5ppm (colour)
75 speed dials, 55 page fax memory
Up to 1200dpi enhanced (300dpi optical) scanning, 24bit colour.

GST Ex $675 + GST $67.50 (84356)
GST INC **$742.50**

HP PSC500
All Colour: Printer, Copier & Scanner

The PSC500 provides incredible printing, scanning and copying at a great price! 1200 dpi printing on photo paper. 9600dpi enhanced scanning, 30 bit colour.

GST Ex $670 + GST $67 (A2299)
GST INC **$737.00**

HP OfficeJet G95
High quality, Networkable All-in-One.

The OfficeJet G95 provides the highest quality printer/copier/scanner and standalone fax to network into your office workgroup environment. The OfficeJet G95 also comes standard with a duplexing unit.

GST Ex $1,623 + GST $162.30 (A0056)
GST INC **$1,785.30**

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Passion for Printing Ideas

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nium Photo Quality
)0 x 1200 dpi (black and color) on paper types.
to 7.5 pages per minute black, up 3.5 pages per minute color
Mac Compatible
tures one-click printer driver ware installation, cartridge loading nk level indicators.
u-Feed™ paper handling virtually inates jams, wide range of media n envelopes & transparencies to er stock up to 150 lbs.

Ex:$164 + GST: $16.40 (A3419)
T Inc: **$180.40**

Z42 Color Jetprinter
The Leading Edge in Photo Quality
- 2400 x 1200 dpi (black and color) on all paper types.
- Up to 10 pages per minute black, up to 5 pages per minute color.
- PC/Mac Compatible
- Features one-click printer driver software installation, cartridge loading & ink level indicators, & online product registration.
- Accu-Feed™ paper handling virtually eliminates jams, wide range of paper from envelopes to transparencies & everything in between.

GST Ex:$240 + GST: $24.00 (A3420)
GST Inc: **$264.00**

Z52 Color Jetprinter
The Leading Edge in Photo Quality.
- 2400 x 1200 dpi resolution in both black & color
- Fast! Up to 15 pages per minute black, up to 7 pages per minute color
- PC/MAC Compatible
- Accu-Feed™ paper handling offers dependable feeding on a wide range of paper from envelopes to transparencies & everything in between
- One-click printer driver software installation

GST Ex:$319 + GST: $31.90 (A3421)
GST Inc: **$350.90**

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Tektronix Phaser 740 Toner

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(71854)
GST Inc:
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(71855)
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(71857)
GST Inc:
$357.50

Phaser 740 Laser Printer

740: Affordable colour laser printer with extraordinary print quality. For breathtaking images that leap off the page, at a breakthrough colour laser price, look to the Phaser 740.

Phaser 750 Laser Printer

750: The NEW Phaser 750 brings affordable, high quality colour printing within reach of all businesses - a revolutionary idea. The Phaser 750 colour printer improves upon the award-winning Phaser 740 colour printer, with increased printing and processor speeds and improved colour quality. A new, faster 200 MHz processor delivers 16 pages per minute black-and-white prints or 5 ppm colour prints.

Tektronix	Phaser 740N	Phaser 750N
Full colour printing	Standard	Standard
Max resolution black/colour600dpi/1200dpi	1200dpi/1200dpi	
Ram Standard/Max	32MB/256MB	64MB/256MB
Image Processor	133Mhz	200Mhz
Print Speed black/colour	16ppm/5ppm	16ppm/5ppm
Pipeline Printing	Optional	Optional
Duplex Manual	Standard	Standard
Auto	Optional	Optional
Code	(71836)	(A1401)
GST Ex + GST	$3,930 + $393.00	$4,997 + $499.70
GST Inc	**$4,323.00**	**$5,496.70**

740N Printer feature: 10BaseT Network-ready printing right out of the box
750N Printer feature: 10/100BaseT Network-ready printing right out of the box
Both printers feature: No developers or other special components that need regular service and Adobe postscript 3

Call Harris Technology on 1300 13 9999 to ask about Tektronix A3 colour lasers!

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38

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LaserJet and InkJet Printers

HP Business Inkjet 2200

The HP Business Inkjet 2200 has a higher print speed (normal mode) than any other HP inkjet. And, like the other two printers in the range, it's extremely cost effective.

- 15ppm black printing, 14ppm colour printing
- HP PhotoREtII
- HPA™ installed
- 250-sheet input tray
- 8MB of memory
- One 96MHz Motorola processor on board

HOT NEW PRODUCT

GST Ex $Call + GST $Call (A3361) GST INC **$Call**

IP Business Inkjet 2250/2250TN

he HP Business Inkjets 2250 and 2250TN come with all the features of ie 2200, and also include:

HP PCL5Ce, HP PostScript level 2 emulation
24MB RAM upgradeable to 88MB
Two 96MHz Motorola processors on board
HP JetDirect 600N internal print server (2250TN only)
Additional 250-sheet input tray (2250TN only)

JUST RELEASED

GST Ex $Call + GST $Call (A3362/A3363) GST INC **$Call**

HP LaserJet 1100 Printer

HP's JetPath technology allows you the flexibility to expand the LJ 1100 into an all-in-one performer when your business needs grow. Crisp, sharp 600dpi laser printing. 8ppm. 2MB RAM.

GST Ex $641 + GST $64.10 (70095) GST INC **$705.10**

P LaserJet 1100A Printer-Copier-Scanner

our business needs require copying & scanning capabilities, move up to the LaserJet 00A. Printing, copying and scanning: all-in-one. Make laser copies at the touch of a ton. Scan resolution 600dpi enhanced, 300dpi optical.

GST Ex $753 + GST $75.30 (70096) GST INC **$828.30**

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P LaserJet 2100 ries

models feature:
200dpi resolution
0ppm print speed
0MHz processor
50-sheet capacity
5,000 page monthly
uty cycle
xcellent performance

LaserJet 2100 GST Ex $1,115 + GST $111.50
A fast flexible laser with room to grow. EIO, PCL 6, 4MB RAM. (72291) GST INC **$1,226.50**

LaserJet 2100M GST Ex $1,316 + GST $131.60
A fast flexible laser with PS and PCL. EIO, PCL 6, 8MB RAM. (72292) GST INC **$1,447.60**

LaserJet 2100TN GST Ex $1,484 + GST $148.40
A complete network printer. EIO, PCL 6, 8MB RAM, additional 250-sheet feeder, HP JetDirect print server installed. (72293) GST INC **$1,632.40**

LaserJet 4050 ries

models feature:
00dpi resolution
ppm print speed
3MHz processor
0-sheet capacity

LaserJet 4050 GST Ex $1,794 + GST $179.40 (77443)
PCL 6, 8MB RAM. GST INC **$1,973.40**

LaserJet 4050N GST Ex $2,236 + GST $223.60 (77445)
PCL 6, 16MB RAM. GST INC **$2,459.60**

LaserJet 4050TN GST Ex $2,682 + GST $268.20 (77446)
PCL 6, 16MB RAM GST INC **$2,950.20**

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WE'RE OPEN THROUGHOUT THE OLYMPICS

A4 BJC-3000

GST Ex $222 + GST $22.20 (94499) GST INC

$244.20

- Up to 9ppm print speed black
- 1440 dpi
- Separate replacement colours

A3/A4 BJC- 6500

GST Ex $563 + GST $56.30 (95962) GST INC

$619.30

LBP1000

10 pages per minute print engine at 1200 dpi resolution. Energy saving 'On-Demand' toner fusing. Cost-saving 'economy' printing mode. Powerful processor to ensure maximum throughput. Memory Saving Technology to accomplish more in less RAM. PCL6 Print Language emulation. Optional genuine Adobe® PostScript® 3™ printer language. Optional second 250 sheet paper feeder. Maintenance free 'all-in-one' toner and drum cartridge. 4 MB RAM standard - upgradeable to 36 MB.

GST Ex $1,053 + GST $105.

(95983) GST INC **$1,158.3**

BJC-1000SP

Super Economy Mode in black & white & colour. Vivid colours, on plain paper. Photo Mode colour, optional PhotoRealism. Auto image improvement. Print banners up to 6 A4 pages, envelopes, transparencies, glossy photo paper, high gloss film & T-shirt transfers.

GST Ex $122 + GST $12.20 (A1792) GST INC

$134.20

BJC-2100SP

NEW!

High performance at a low price - the ultimate printer! Ultra compact design. Up to 5ppm in monochrome. Up to 2ppm in colour. 4-colour photo printing. Optional colour image scanning. Range of driver features. Banner printing. USB + parallel interface.

GST Ex $160 + GST $16.00 (A3173) GST INC

$176.00

BJC-6200

NEW!

Compact design and uncompromised performance! Up to 10ppm in monochrome. Up to 7ppm in colour. 1440 x 720 dpi. 6-colour photo printing. Sharper, blacker text. Optional colour image scanning. Separate colour ink cartridges! USB + parallel interface.

GST Ex $325 + GST $32.50 (A3507) GST INC

$357.50

LBP800

Desktop laser, 8ppm, 300x300dpi, 600x600dpi and 2,400dpi with text and line smoothing. 512k buffer. 2,500 pages per cartridge (5% cover). Win® 95, 98 and NT 4.0.

GST Ex $468 + GST $4

(83787) GST

$514.

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MOST COMPACT, LIGHTWEIGHT FLATBED SCANNERS AVAILABLE!

- OmniPage OCR software included (N650U & N1220U Only) Full Version 9.0
- Plug & Play
- Fully integrated software package
- Silent & fast scanning
- Super slim & compact

NEW RANGE!

N650U	N1220U	FB-1210U
600x1200dpi.	1200x2400dpi.	1200x2400dpi
GST Ex $190 + GST $19.00	GST Ex $244 + GST $24.40	GST Ex $407 + GST $40.70
(A3522) GST INC	(A3523) GST INC	(A3524) GST INC
$209.00	**$268.40**	**$447.70**

DIGITAL IXUS

NEW!

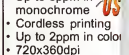
Ixus is the worlds smallest digital camera with a zoom lense. 2.11 mega pixel with 8Mb flash card.

GST Ex $1,135 + GST $113.50 (A3521) GST INC

$1,248.50

BJC-85

- *Mac & Windows Multi-interface USB*
- Up to 5ppm in monochrome
- Cordless printing
- Up to 2ppm in colo
- 720x360dpi
- Optional 4-colour p printing



GST Ex $324 + GST $3

(A0993) GST INC

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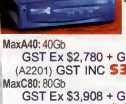
Next Generation Backup Solutions

MaxAttach NAS System



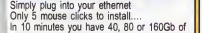
NEW!

Simplest way to add file services to any NT or Unix Network.

MaxA40: 40Gb
GST Ex $2,780 + GST $278.00
(A2201) GST INC **$3,058.00**

MaxC80: 80Gb
GST Ex $3,908 + GST $390.80
(A2204) GST INC **$4,298.80**

MaxC160: 160Gb
GST Ex $5,530 + GST $553.00
(A2205) GST INC **$6,083.00**



Simply plug into your ethernet
Only 5 mouse clicks to install....
In 10 minutes you have 40, 80 or 160Gb of disk storage on line.
Simple Web Browser administration.
No NT licenses to buy!
95/98NT and Unix network compatible
Now in 1 RU high models (4.5 cm high)
Disk Spanning, JBOD or Raid level 1 built-in
Free Reflect-It software to automatically backup you laptops or PCs.

Backup Software - TapeWare

TapeWare Lite: Single Server backup for NT, Netware or Linux

GST Ex $425 + GST $42.50
(97849) GST INC **$467.50**

TapeWare - Loaded with features yet simple to use. TapeWare is simple to install and easy to administer whether you have a single PC or a large enterprise network.

- Quick Start Wizards set up most common applications quickly
- Advanced and predefined scheduling features
- Built in free 6 slot autoloader support
- Desktop, Single Server, Enterprise and Data Centre Versions
- Options for MS-Exchange, Cluster, SQL, SAN etc

Tandberg SLR Tape Drives

NEW!

"Designed for price performance and superior reliability"

SLR40 (Internal)
- 20Gb native, 40 compressed
- 3-6Mb sec, 21 Gb/hour

GST Ex $2497 + GST $24.97
(A2313) GST INC **$2,746.70**

SLR60 (Internal)
- 30Gb native, 60 compressed
- 4-8Mb sec, 28 Gb/hour

GST Ex $2,870 + GST $287.00
(A2206) GST INC **$3,157.00**

SLR100 (Internal)
- 50Gb native, 100Gb compressed
- 5-10Mb sec, 36 Gb/hour

GST Ex $4,817 + GST $481.70
(A2207) GST INC **$5,298.70**

ECRIX VXA-1 Tape Drive

INTERNAL GST Ex $1,558 + GST $155.80 (91106) GST INC **$1,713.80**

EXTERNAL GST Ex $1,649 + GST $164.90 (91110) GST INC **$1,813.90**

3 GB Native, 66GB compressed
-6MB sec sustained, that's 21.6GB/Hr
CSI-2 and LVD models available.
ariable speed operation matches data
roughput to your computer
acket based technology guarantees
liable restores
NUX approved
ariety of case colours ("White, black,
d, translucent)
ompatible with most backup software

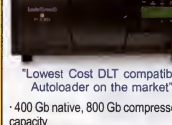
Benchmark DLT1 Tape Drive

INTERNAL
GST Ex $2,908
+ GST $290.80 (88037)
GST INC **$3,198.80**

EXTERNAL GST Ex $3,125 + GST $312.50 (88038) GST INC **$3,437.50**

- 40GB native, 80GB compressed
- 3-6MB sec sustained, that's 21.6GB/Hour
- Ultra Wide SCSI LVD interface
- Reads DLT4000/tapes (20/40Gb Only)
- Internal or External models
- LINUX Approved
- 7 tape autoloader available
- Compatible with most common backup software
- Standard DLT form factor

Overland DLT1 Based Autoloader



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"Lowest Cost DLT compatible Autoloader on the market"

· 400 Gb native, 800 Gb compressed capacity
· DLT1 Single Tape Drive included
· 10 tape capacity
· Overland DLT reliability
· LVD 68 pin SCSI Interface
· Includes 1 data tape and cable
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GST Ex $7,786 + GST $778.60
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Quantum DLT4000/ST
GST Ex $1,900 + GST $190.00 (70917)
$2,090.00

Quantum DLT7000/ST.
GST Ex $6,781 + GST $678.10 (41608)
GST INC **$7,459.10**

Quantum DLT8000/ST.
GST Ex $6,896 + GST $689.60 (82501)
GST INC **$7,585.60**

DLTtape media
DLT2000XT 15/30GB Tape
GST Ex $73 + GST $7.30 (68362)
GST INC **$80.30**

DLT4000 20/80GB Tape
GST Ex $128 + GST $12.80 (71231)
GST INC **$140.80**

DLTclean Cleaning Tapes
GST Ex $73 + GST $7.30 (97851)
GST INC **$80.30**

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® Retrospect® Backup for Windows

Retrospect Clients

Adds support for more networked computers

With the addition of cross-platform Retrospect Clients, use Retrospect to back up your whole network, including Windows 95, 98, NT 4.0 Workstation & Server, Mac and Windows 2000 computers. Back up any client-equipped computer on the network without installing file servers, starting file sharing, or mounting volumes.

5-pack:
GST Ex $259
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(88260)
GST INC
$284.90

10-pack:
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50-pack:
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(88263)
GST INC
$3,188.90

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Retrospect Express Backup

The easiest, most reliable personal backup

GST Ex $109
+ GST $10.90
(98456)
GST INC
$119.90

Retrospect Express Backup makes it fast and easy to back up, restore, and arc
With an interface that's easy to navigate and backups that can be accomplished
few quick steps, Retrospect Express eliminates the hassle and inefficiency of drag
files from one volume to the next. Features include:

- **Easy, automated backups:** Backups launch automatically to run unattende
any schedule.
- **Reliable one step restores:** Restores an entire hard disk in a single step
after multiple incremental backups
- **Device Support:** Simplifies installation by immediately recognising your ba
device and automatically loading the appropriate driver.
- **Compression and Encription:** Dramatically improves storage media capa
and decreases media costs.
- **IncrementalPLUS Technology:** After the initial backup, Retrospect Exp
backs up only new or changed files, saving time and storage media.

Retrospect Desktop Backup

The best backup software for any storage device

GST Ex $340
+ GST $34.00
(88034)
GST INC
$374.00

Retrospect Desktop Backup is the ultimate tool for backing up a single workstati
any storage media. It combines performance, unattended operation, low admini
tion costs, and a complete feature set within an intuitive interface. Retrospect Des
Backup builds on the features of Retrospect Express Backup with:

- **Expanded Device Support:** Supports most tape drives/autoloaders up to 8
- **Network Ready:** Adds support for another 5, 10, 50, or 100 networked compu
to your copy of Retrospect Backup with Retrospect Clients
- **Compression and encryption:** Dramatically improves storage media capa
decreases media costs. Provides security for confidential files.
- **IncrementalPLUS ™ technology:** After the initial backup, Retrospect back
up only new or changed files, saving time and storage media.
- **Duplicates:** Performs immediate or scheduled copying of any local volume,
network volume, or folder to any other.
- **Archiving:** Store little-used files onto media to reduce free up hard disk spac
- **Expanded Device Support:** Supports most tape drives/autoloaders up to 8

Retrospect Workgroup Backup

The best, most reliable backup for your workgroup and server

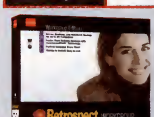
GST Ex $699
+ GST $69.90
(88087)
GST INC
$768.90

Retrospect Workgroup Backup provides powerful backup for your entire workg
across the network to a single storage device. Integrate both desktop computers
notebooks who connect to the network at irregular times into the same backup sche
Includes all the features of Retrospect Desktop Backup listed above, plus:

- **Central administration:** One person can manage all backup functions:
eliminates lengthy user training and difficult installation at each workstation.
- **Backup Server ™:** Determines which computers are most in need of back
and backs them up in order of priority, including notebooks.
- **Advanced security:** Prevents unauthorized access to sensitive data with
password protection while retaining individual user's privacy. Encrypts netwo
transfers for additional security.

INCLUDES THE RETROSPECT APPLICATION PLUS 20 CLIENTS

Retrospect Server Backup



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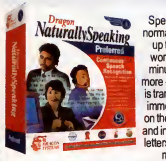

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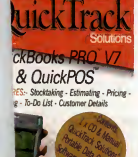

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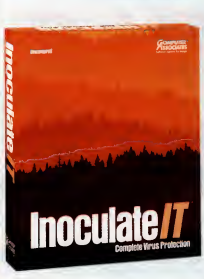

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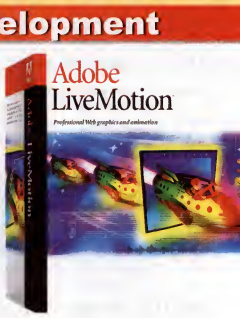

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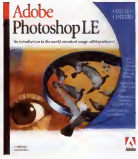

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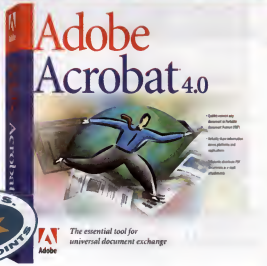

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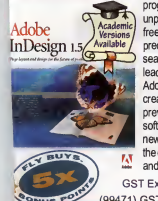

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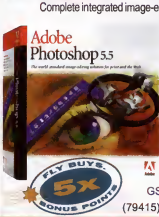

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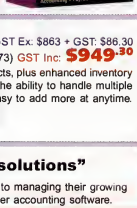

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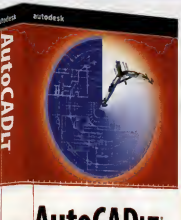

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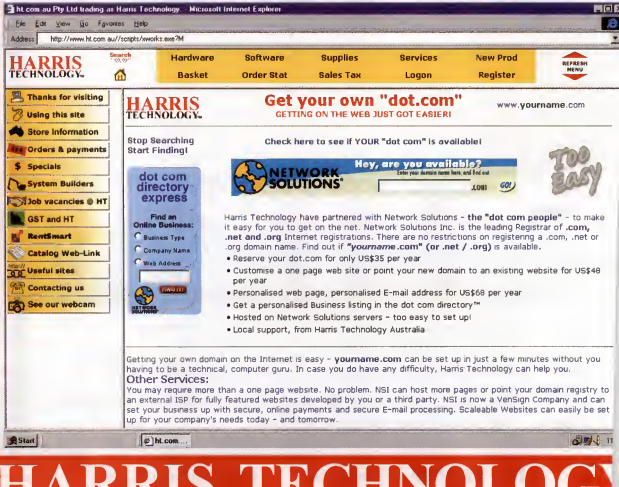

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Using Fileman.vbs

A command-line tool for changing file ownership

Now and then I need to change ownership of a file that is on an NTFS drive. I can do that with the GUI through My Computer or Windows Explorer (select the file, right-click it, choose Properties from the resulting context menu, choose the Security tab, and click the Ownership button), but as is so often the case, I'd like to be able to do this task from the command line as well.

Windows NT resource kits have long included the Chown utility for changing ownership, but I've never been able to make it work. So, I was excited to find fileman.vbs tucked among the dozens of VBScript routines in the Microsoft Windows NT Server 4.0 Resource Kit Supplement 4. Fileman.vbs lets you copy, delete, rename, or seize ownership of a file. Command-line tools already exist to copy, delete, and rename files, but I was glad to finally have a command-line ownership tool. The tool is a mite cumbersome, as you'll see. But because it's a script file, you've got the source code, so enterprising readers can address some of fileman.vbs' flaws.

To change a file's ownership, you invoke fileman.vbs:

```
cscript <scriptpath>\fileman.vbs /T <fullyqualifiedfile-
name>
```

The syntax looks straightforward, but kinks exist. First, notice the scriptpath part – you feed the name of the VBScript file to cscript, so you need to provide fileman.vbs' qualified name and location. Because my resource kit files are in C:\ntreskit, my command would begin with cscript c:\ntreskit\fileman.vbs. Second, the /T option is case sensitive. Third, you must specify the fully qualified name of the file that you want to seize ownership of. Typically, when you execute a command from within the same drive and directory as the file on which the command acts, you can omit the file's directory and drive letter. Not here! To take ownership of the names.txt file on D:\myfiles, I'd need to type:

```
cscript c:\ntreskit\fileman.vbs /T d:\myfiles\names.txt
```

Finally, you can't feed fileman.vbs wildcards – you can't simply tell fileman.vbs to change ownership on *.* and walk away secure in the knowledge that fileman.vbs will take ownership of all the files in a directory. You can work around that limitation, however, with a fairly long For statement. For those who've not used it, the For command lets you tell NT to repeat a specified command for a group of files. Simplified, the For command looks like:

```
for %f in (*.*) do
<somecommand> %f
```

This command causes NT to find all files that meet the criterion in the parentheses – I used *.*, but you could use anything – and to replace %f with each file's name, one at a time. With each replacement, the For command executes the specified command, again replacing %f with the current filename. For example, to tell fileman.vbs to take ownership of every file in a directory named C:\soontobemine, I'd type:

```
for %f in (c:\soontobemine\*.*) do cscript c:\ntreskitfile-
man.vbs /T %f
```

Because I specify a drive and directory name in the parentheses, each execution of the specified command includes that drive and directory name, so I don't need to type the drive and directory in the right-hand part of the command. If I wanted to execute the For command from inside C:\soontobemine, then I could have a shorter term in parentheses, but I'd need a longer right-hand portion:

```
for %f in (*.*) do cscript c:\ntreskit\fileman.vbs /T
c:\soontobemine\%f
```

One final note: If you want to include a For command in a batch file, you must change %f to %%f, as in:

```
for %%f in (c:\soontobemine\*.*) do cscript
c:\ntreskit\fileman.vbs /T %%f
```

Now, readers, what clever soul will modify fileman.vbs script so that it will work on an entire drive, rather than just a directory? One of you, I hope!

ABOUT THE AUTHOR

Mark Minasi is a senior contributing editor for Windows 2000 Magazine, an MCSE, and the author of Mastering Windows 2000 Server, 2nd edition (Sybex). He writes and speaks around the world about Win2K and Windows NT networking. You can reach him at help@minasi.com.

Connecting Linux Workstations to Win2K and NT Servers

by: Mark Minasi

Adding Linux to a Windows 2000 (Win2K) – or Windows NT-based network can be a good idea. Linux provides an inexpensive way to implement basic Internet services (for example DNS servers, vanilla Internet mail servers, Web servers) on low-power hardware. Linux also offers excellent uptime and reliability, although at the cost of increased administrative complexity.

But adding a new OS to any existing network can bring a fresh set of headaches in the form of interoperability questions. For example, you might wonder:

- Can I run my Win32 applications on a Linux box?
- How do I keep Win2K or NT and Linux user accounts in sync?
- How do I transfer data between Win2K or NT servers and Linux workstations?

This month, I look at a tool that answers the third question. (In case you're wondering, the answer to the first question is yes: WINE, a free tool that ships with most copies of Linux, lets you run Windows programs under Linux. Regarding the second question, I've heard that some NT-Linux directory synchronisation tools exist, but I don't know much about them yet.)

What You Need to Know

To help a Linux box access Microsoft file shares, you need to know three things. First, you need to know how to use the command-line commands smbmount and smbumount. Second, you must know how to create a new directory on your Linux system's hard disk. Finally, you'll make your life a bit easier if you also know how to create and use the configuration file smb.conf. Smbmount, which is essentially the Linux version of Win2K and NT's Net Use command, connects your Linux box to a Microsoft file server. Smbumount breaks a connection to a Microsoft file server. Smbmount and smbumount started life as programs that someone (the documentation doesn't say who) created to let Linux boxes connect to Server Message Block (SMB)-based servers. (SMB is a message format that Win2K, NT, Windows 9x, NT LAN Manager – NTLM – and Windows for Workgroups – WFW – file servers use.) Since the commands' creation, they've become part of a large package named Samba, whose main task is to let you use a Linux box to mimic an SMB server – Linux in NT's clothing, you might say.

In this column, I assume that you're a Linux tyro (I know I am), so I include some basic instructions for navigating around a Linux box. (Experienced Linux or UNIX users whom I bore with the basics have my apologies.)

Smbmount needs a mount point, a local directory that smbmount can map the Win2K or NT network share to so that Linux knows how to refer to the share. Net Use, the command-line command to connect to a Win2K or NT share, maps a network share (for example \\myserver\myshare) to a drive letter (for example P). The benefit of calling a network share by a drive letter is to unify the look of the data that your Win2K, NT, or Windows system sees: All your data, even network shares, looks like local directories on your hard disk.

The Linux folks also want to provide a common look and feel for your data, whether it's sitting on a local hard disk or on a machine elsewhere on the network. But because Linux doesn't use drive letters, it needs some other method to blend network shares into the local-disk paradigm. Using a mount point is the means to that end. First, you create a new directory (a directory in which you don't actually store anything) on your Linux hard disk. Then, you tell smbmount to "glue" (mount) the network share onto that directory. From that point on, to access files on the share, you issue commands to access that directory. To create a directory on a Linux box, you use the mkdir command. I created a directory on my system with the command mkdir /myntshare.

Accessing Data

After you have a mount point, you use the smbmount command to connect to the Win2K or NT share. Suppose I want to access a share named data on an NT server named \\alnilam. Of course, I need an NT user ID and password so that I can access data. Let's say the username is usermark and the password is swordfish. I also need to know the server's IP address. We'll assume the address is 200.200.100.10. I can then map \\alnilam\data to the /myntshare directory with the command:

```
smbmount //alnilam/data /myntshare -U usermark -
```

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```
200.200.100.10
```

(When you enter a Linux command, type the entire command on one line.) Notice that you use slashes (/), rather than using the customary backslashes (\), when you type the share's Uniform Naming Convention (UNC) name. Linux also uses slashes to separate parts of a file's location.

After I enter the command, the system displays a couple of lines of messages and requests my password. I simply type the password and press Enter, and I'm in. From this point on, I access the /myntshare directory to access files on the server. For example, to copy the abc.txt file from the NT server's share to the /localstuff directory on the Linux box, I'd type:

```
cp /myntshare/abc.txt /localstuff
```

This syntax should look familiar – cp is Linux's Copy command. The smbmount command has an extensive set of options, but in general, it looks like:

```
smbmount <UNC> <mountpoint> -U <username> -I <ipaddress>
```

where UNC is the UNC name of the share you want to connect to, mountpoint is the directory you want to attach the share to, and username is the NT user account name. The options are case sensitive: You must use uppercase I and U, and you must type the command and parameters in lower case. The -I option is important because smbmount doesn't seem to know how to find the NT server by doing NetBIOS name broadcasts. As I explain later, smbmount can use a WINS server to look up a server's address, but if you haven't told smbmount about WINS and don't specify an IP address, smbmount will not only fail but won't let you use the mount point until you reboot the Linux box.

Configuration File Smb.conf

To tell smbmount about the WINS server, you must create an ASCII file called smb.conf. Linux usually stores this file in the /etc/ directory (if you want to sound like a Linux expert, pronounce /etc/ as ET-see). Some Linux implementations modify that storage location. For example, I verified everything in this column on systems running Red Hat Linux 6.1, Linux Mafia's Slackware Linux 7.0, Caldera Systems' OpenLinux 2.3, and Corel LINUX. (A fifth distribution, SuSE Linux 6.3, didn't activate the Ethernet card for some reason, so I couldn't test that distribution.) Red Hat Linux and Slackware put smb.conf in /etc/, OpenLinux puts the file in /etc/samba.d/, and Corel LINUX puts it in /etc/samba. Red Hat Linux and Corel LINUX install a basic smb.conf file when you put the distribution on your computer; Slackware and OpenLinux do not, installing instead a file named smb.conf.sample that you must modify and rename to smb.conf.

You need only two lines in smb.conf:

```
[global]
wins server = <ipaddress>
```

Because smbmount reads smb.conf every time you invoke the command, you don't need to restart services or reboot. If alnilam's local WINS server's IP address is 200.200.100.50, I'd put the following lines into smb.conf on the Linux box, probably in /etc/:

```
[global]
wins server = 200.200.100.50
```

Then, to connect, I'd type the command

```
smbmount //alnilam/data /myntshare -U usermark
```

After I enter my password at the prompt, I can access the share. Alternatively, I can follow the username with a percent sign and the password so that the command doesn't need to prompt for a password:

```
smbmount //alnilam/data /myntshare -U usermark%sword-fish
```

If you're not comfortable using Linux's workhorse text editor vi to create smb.conf, you can either create the file with one of the GUI editors that ship with Linux or use the following variation of an old DOS trick. First, type:

```
cp /dev/tty /etc/smb.conf
```

and press Enter. This command tells Linux to copy data that you enter at the keyboard – the stuff you're about to type – to a file named /etc/smb.conf.

After you carry out that command, everything you type goes into the /etc/smb.conf file; Linux doesn't try to interpret what you type. To tell Linux that you're finished, you press Ctrl+D. Although you can't edit a mistake on a previous line when you use this trick, it gives you a quick-and-dirty way to create a new file.

To see the file you just created, type:

```
cat /etc/smb.conf
```

(The cat command is Linux's Type command. Conveniently, you don't have to create smb.conf if you're running Corel LINUX. If the Corel box gets its IP information from a DHCP server, Corel LINUX automatically puts your WINS server's address into smb.conf.

After you've finished working with a share, you disconnect it with the command smbumount mountpoint. So, I'd type:

```
smbumount /myntshare
```

to disconnect. ❑

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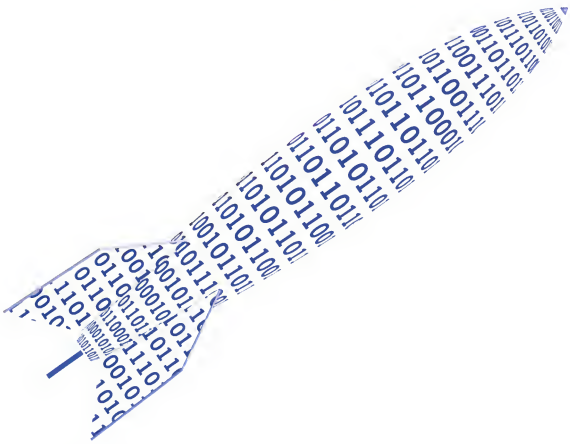

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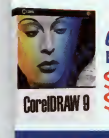

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Tricks & Traps

by: Bob Chronister

Q: ***My office's various Windows NT workstations behave differently toward the Num Lock key's boot-up status. How can I control these behaviours?***

A: On Windows 2000 (Win2K) and NT systems, a Registry value controls the Num Lock key's status at startup. You can manually set the value on a specific machine, or you can control groups of machines by using a group or system policy (i.e., the former for Win2K systems and the latter for NT systems) that contains a reference to the Registry value.

You can find this value in the HKEY_USERS\.DEFAULT\Control Panel\Keyboard Registry key. The InitialKeyboardIndicators subkey is of type REG_SZ and can have a value of 0 (i.e., NumLock Off, the default value) or 2 (i.e., NumLock On).

Q: ***Until recently, I've used the Microsoft Windows NT Server 4.0 Resource Kit's Scopy utility to preserve file and directory permissions when I migrate files between network servers. Scopy lacks features that I'd like to have for these tasks, but professional file-migration and replication packages are costly. Can you recommend any freeware or shareware utilities that can copy NTFS permissions, auditing, and ownership information?***

A: Scopy lacks logging features and is occasionally unreliable during copy operations. For example, Scopy sometimes skips files for no apparent reason and without an accompanying error message. You can work around the utility's lack of logging features by piping the command's output to a text file: Simply place an output redirection symbol and filename at the end of the command line, such as:

```
scopy *.* D:\ ><filename.txt>
```

However, Scopy's limitations make the utility ill-suited for use with NTFS-based files on file servers or other mission-critical systems.

As an alternative, you can use the resource kit's Robocopy utility for individual copy and move operations or for ongoing directory replication. Robocopy supports the preservation of NTFS permissions, auditing, and ownership information during copy and move operations (if you run Robocopy with the /sec switch). The utility also offers several other useful features, such as the abilities to mirror entire directory structures, seed directory structures on a target drive without copying files, exclude files that meet certain criteria, and restart aborted copy operations at the point of failure.

You can use the At command (or Task Scheduler, depending on your NT service pack level) to schedule Robocopy to perform particular file-copy or directory-mirroring tasks at various intervals during the day.

Because Robocopy provides superior flexibility and efficiency, you might even consider using Robocopy in lieu of NT's built-in directory-replication service for intraserver replication of the Netlogon folder's contents.

Q: ***I'm responsible for managing my company's user accounts. One of my complaints about Windows NT is the amount of time and effort necessary to create user accounts and their associated resources (for example profile directories, home directories). NT's default administration model forces me to go through several tedious steps to complete this task. Can you help me find an easier way to get this job done?***

A: Several solutions exist that can help ease your administrative burden. If you know how to write basic scripts, you can accomplish many otherwise tedious steps with a script or batch file. For example, you can create a simple batch file that accepts a username and password as parameters and uses this information to create the account, create and share the home directory, and set the appropriate directory permissions.

Makeuser.cmd is an example batch file that performs these functions. The script requires administrative privileges. Also, because the script uses several Microsoft Windows NT Server 4.0 Resource Kit utilities, access to the resource kit is necessary on the system from which you run the script. The batch file's syntax is:

```
makeuser <server> <drive>
<username> <password>
```

in which server is the name of the server that houses the user's home directory, drive is the drive letter on the specified server that houses user home directories, username is the NT user name of the created user, and password is the user's password.

To create the home directory, share it, and set permissions, use the resource kit utilities Xcacls and

Rmtshare (permissions are admin=Full, user=Change) as follows:

```
md \\%1\%2$\Users\%3
xcacls \\%1\%2$\Users\%3 /t /e /g
%3:C;C Administrator:F;F
xcacls \\%1\%2$\Profiles\%3 /t /e /g
%3:C;C Administrator:F;F rmtshare
\\%1\%3$=%2:\Users\%3
```

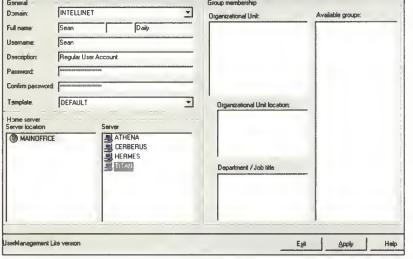
in which \Users is the base user home directory folder on the server and \Profiles is the user profile directory. The script assumes that \Users and \Profiles are on the same drive. If not, adjust the references accordingly before you run this batch file. If the server name and drive letter are always the same, you might also want to hard-code these within the script and remove them as variables.

Next, add the user and set the home directory paths in User Manager with a dollar sign ($) at the end (i.e., to hide the share):

```
net user /add /domain %3 %4
/homedir:\\%1\%3$
```

This script is only a simple example – you can certainly make the script more useful with some creative tweaking. For example, you can modify the script to accept additional parameters (for example other user property settings) or instruct the script to read user data from a file rather than from command-line parameters. For more information about NT shell scripting, see Tim Hill, Windows NT Shell Scripting (MacMillan Technical Publishing, 1998).

If you prefer using a GUI-based utility to manage users, the market offers several good solutions. My favourite inexpensive choice is Simac Software's UserManageneNT Lite. This freeware utility, a light version of Simac's UserManageneNT Professional, lets you quickly and easily create users and their associated attributes and resources. Screen 1 shows UserManageneNT Lite's GUI.) These characteristics include basic items such as home and profile directories and logon scripts,



Screen 1: Viewing Simac UserManagement NT Lite's GUI

users' Microsoft Exchange Server mailbox properties, and NT Server 4.0, Terminal Server Edition (WTS) configuration settings. You can download UserManageneNT Lite at http://www.tools4nt.com.

A similar shareware utility is Anders Wåhlin's difficult-to-find NT Multiple Users Manager (NTMUM) utility. After some searching, I finally located the tool at http://www.chasque.apc.org/dsm/faecher/informat/technik/tools/nmum25.exe.

A third inexpensive utility is EnterNett's User Manager Assistant. You'll find a free trial version of User Manager Assistant (UMA) at http://uma.enternett.no.

Finally, you might require a full-featured user-management package that gives you delegation of administration and other enterprise-oriented capabilities. If you need such a package, check out the offerings from FastLane Technologies, Mission Critical Software, Entevo, and Aelita.

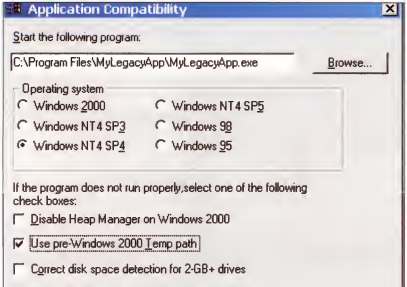
Q: ***Although I'm happy with the reliability and performance of my Windows 2000 Professional (Win2K Pro) system, I'm having compatibility problems with some of my applications. One particular application runs fine on a system that I upgraded from Windows 98 to Win2K Pro. However, when I try to install the same application on a new Win2K Pro installation, the installation fails, stating that I need to have Windows NT 4.0 Service Pack 4 (SP4) or later installed. I also have a digital camera application that supports USB, but only on Win98. However, I know that Win2K Pro supports USB, and the OS recognised and loaded a driver for my camera. Can I trick these applications into thinking that Win2K Pro is an earlier version of NT or a different version of Windows?***

A: These problems are common because many applications and installation utilities existed long before Windows 2000 (Win2K); many of the tools' version-checking methods consider Win2K to be an earlier version of NT rather than a successor. I've also discovered that many applications that claim not to be Win2K-compatible actually run smoothly under Win2K (if you can bypass the version-detection problem).

Microsoft included a utility on the NT 4.0 CD-ROM called setwin95.cmd, which lets you fool programs such as games into thinking that NT is Win95. Microsoft has taken this idea a step further in Win2K by introducing the Application Compatibility tool (apcompat.exe). Screen 2 on page 76 shows the GUI of this utility, which is available on the Win2K CD-ROM and is part of Win2K's Support Tools. (Located in the CD-ROM's \Support folder, the utility installs when you install the Support Tools.)

In some cases, you can use Application Compatibility to fool a legacy application into thinking that the application is compatible with one of

Screen 2: Using the Application Compatibility tool



several OSs: Win2K; NT 4.0 SP3, SP4, or SP5; or Win9x. The tool also lets you modify behaviours that sometimes cause problems for legacy applications; for example, you can prevent an application from seeing more than 2GB on a disk volume, use a pre-Win2K-style \Temp directory, and disable Win2K's Heap Manager.

If a specific application requires a particular set of changes to run, you can make the spoofing behaviour permanent so that you don't need to launch Application Compatibility each time you run the application. Finally, you can use one command line to launch a program through the Application Compatibility tool and its various options.

The command's format and supported parameters are as follows. (Note: Don't put a space between the =v or =x options and their related parameter data, or they won't work.)

```
apcompat <-?> <-vVersion Name>
<-xProgram Path> <-d> <-t> <-g> <-
k>
```

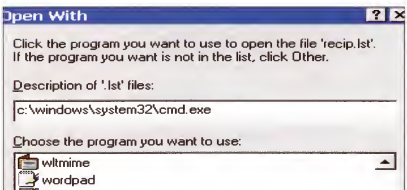
in which -? displays the syntax for the command-line parameters, -vVersion Name specifies the name of the OS you want to return to the specified program (i.e., 1 returns NT 4.0 SP3, 2 returns NT 4.0 SP4, 3 returns NT 4.0 SP5, 4 returns Win98, and 5 returns Win95), -xProgram Path specifies the path and name of the .exe file for the program you want to run, -d disables the Heap Manager for the portion of memory reserved for the specified program, -t uses \Temp for the Temp folder when running the specified program, -g corrects disk-space detection, and -k stores the specified Application Compatibility settings.

For example,

```
apcompat -v4 -xc:\myapp\myapp.exe
```

would run an application named myapp.exe in the C:\myapp folder and make the application believe it's running under Win98.

Screen 3: Tricking NT Setup into opening a command prompt window during TCP/IP Configuration



Q: ***Occasionally, I need to install Windows NT 4.0 BDCs and other NT systems over a WAN connection, and the PDC is on the other side of the link. However, when I enter the third phase of Setup (i.e., the GUI part), an error message tells me that the computer can't find the domain controller; therefore, I'm unable to join the domain. I use an LMHOSTS file that contains the following lines:***

```
10.10.10.1        MY_PDC    #PR
#DOM:MY_DOMAIN
10.10.10.1        "MY_DOMAI
\0x1b" #PRE
```

According to the Microsoft article "How to Write an LMHOST

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File for Domain Validation and Other Name Resolution Issues" (http://support.microsoft.com/support/kb/articles/q180/0/94.asp), my method should work. What am I doing wrong?

A: I've encountered the situation you describe on several occasions. A potential workaround exists. First, I want to provide some clarification: I believe the Microsoft article you're referring to is "How to Install a BDC in a Routed TCP/IP Environment" (http://support.microsoft.com/support/kb/articles/q140/4/76.asp).

However, this article contains an apparent contradiction: The article states that the total length of the domain name string inside the double quotes in the LMHOSTS entry needs to be 20 characters. However, in the article's example, Microsoft lists a domain name that contains 10 characters (i.e., DOMAINNAME) followed by one space and the \0x1b hexadecimal code - a total of only 16 characters. The 20-character statement is correct, despite the typographical error.

The significance behind the 16-character length is that NetBIOS names (for example domain names, machine names) can contain as many as 15 characters, as well as a 16th character that indicates the NetBIOS suffix (representing the NetBIOS service type).

In the case of your LMHOSTS entry, the suffix that the hex code \0x1b represents is that of the domain master browser. For a complete list of NetBIOS suffixes and their respective meanings, see the Microsoft article "NetBIOS Suffixes (16th Character of the NetBIOS Name)" at http://support.microsoft.com/support/kb/articles/q163/4/09.asp.

Creating an LMHOSTS file might resolve your problem, depending on whether the file existed before the system initialised the TCP/IP stack. If the file did exist, the domain name and domain master browser (i.e., PDC) name should be in the NetBIOS name cache. However, plenty of circumstances exist in which a perfectly good LMHOSTS file won't resolve your problem. In such cases, you can fool NT into opening a command-prompt session.

When you configure the TCP/IP stack during Setup, go to the WINS tab and click Import LMHOSTS. In the Open With dialog box, which Screen 3 on page 76 shows, right-click any file that doesn't already have a file association and choose Open With from the menu.

Next, click Other, browse to the \%systemroot%\system32 folder, and select cmd.exe as the command to use to open the file.

Be careful not to select the Always use this program to open this file check box, because you don't want to create a long-term association for that file type with cmd.exe. After you click OK, NT drops you to a command prompt instead of opening the file.

Now that you have a command-prompt window open, you can take diagnostic and corrective actions that are otherwise impossible during Setup. For example, you can use Ping and Tracert to diagnose connectivity problems, and you can use Nbtstat-R to reload the NetBIOS name cache (including any new entries in the LMHOSTS file) or Nbtstat -c to list cached names and verify that the cache lists the PDC and domain names.

However, remember that NT Setup might not have copied to the hard disk all the utilities that you want to use during this session. In this case, simply copy the files you want to a 3.5-inch disk on another NT system. Then either use the utilities from the 3.5-inch disk or copy the utilities to the hard disk of the system on which you're running the installation. ❑

ABOUT THE AUTHOR

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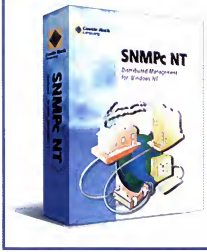

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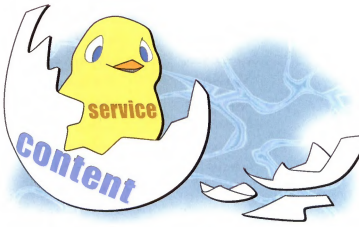
What came first, the provider or the content?



This twist on the chicken-and-egg debate is something providers of streaming media services face. Providers are hesitant to sign up until the content is there, and content providers won't sign until ISPs have agreed to deliver the service.

Axient Communications, the latest entrant in the crowded streaming media market, thinks it has resolved that conundrum with the 2000 Olympic Games in Sydney.

Axient will debut its Octane streaming video service on Sept. 15 at NBCOlympics.com. The Web site will use Octane to rebroadcast some of NBC's Olympic coverage. About 20 minutes of highlights will be available free each day.

Axient is counting on the Olympics to pull ahead in the streaming media race. It won't be easy. The company has got world-class competition from established content distributors like Akamai and Digital Island, satellite-based providers like Cidera and iBeam Broadcasting, and assorted tech heavyweights like AT&T and Exodus.

Axient is making plenty of gold medal claims about Octane. The service provides high-resolution, full-screen, full-motion video with stereo sound – something no other provider can yet deliver, according to Axient.

Microsoft's antitrust mixup in India

One wonders what the Indian government and Microsoft are up to. The branch of India's government that handles antitrust regulation issued a statement Friday saying it would charge Microsoft with monopolistic and restrictive trade practices – then withdrew the statement.

Before India's Monopolies and Restrictive Trade Practices Commission reversed itself, Microsoft denied the charges. The company is expected to launch its Windows ME software in India in September and recently said it will invest substantially in the country.

Hitech meets haute couture

A couple of thoughts that you might not free-associate with each other: supermodel and high-performance mobile computing.

Palm, whose PDA has been positioned as a powerful, corporate device in contrast to competitor devices such as those from Handspring, has a new marketing scheme. The company has teamed with Claudia Schiffer to hawk the Palm Vx Claudia Schiffer Edition device. The model-endorsed brushed metallic-aqua Palm is targeting the fashion-conscious.

"Our goal is to become as essential in pop culture as we are in tech culture," says Palm marketing guru Sativ Chahil.

Memo to Lou Gerstner: Better speed up production of those Cindy Crawford Edition RS/6000s.

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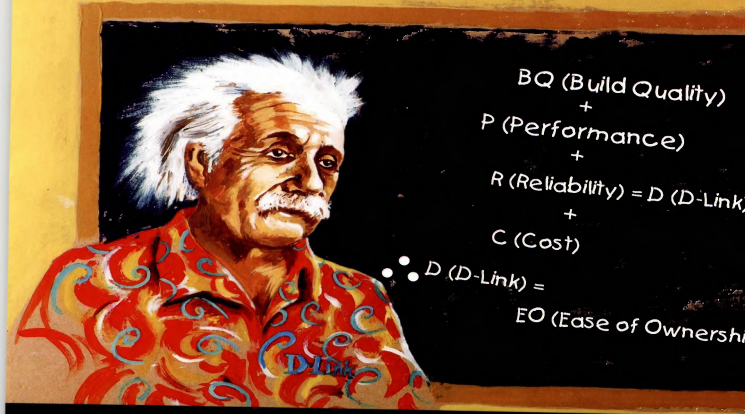

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